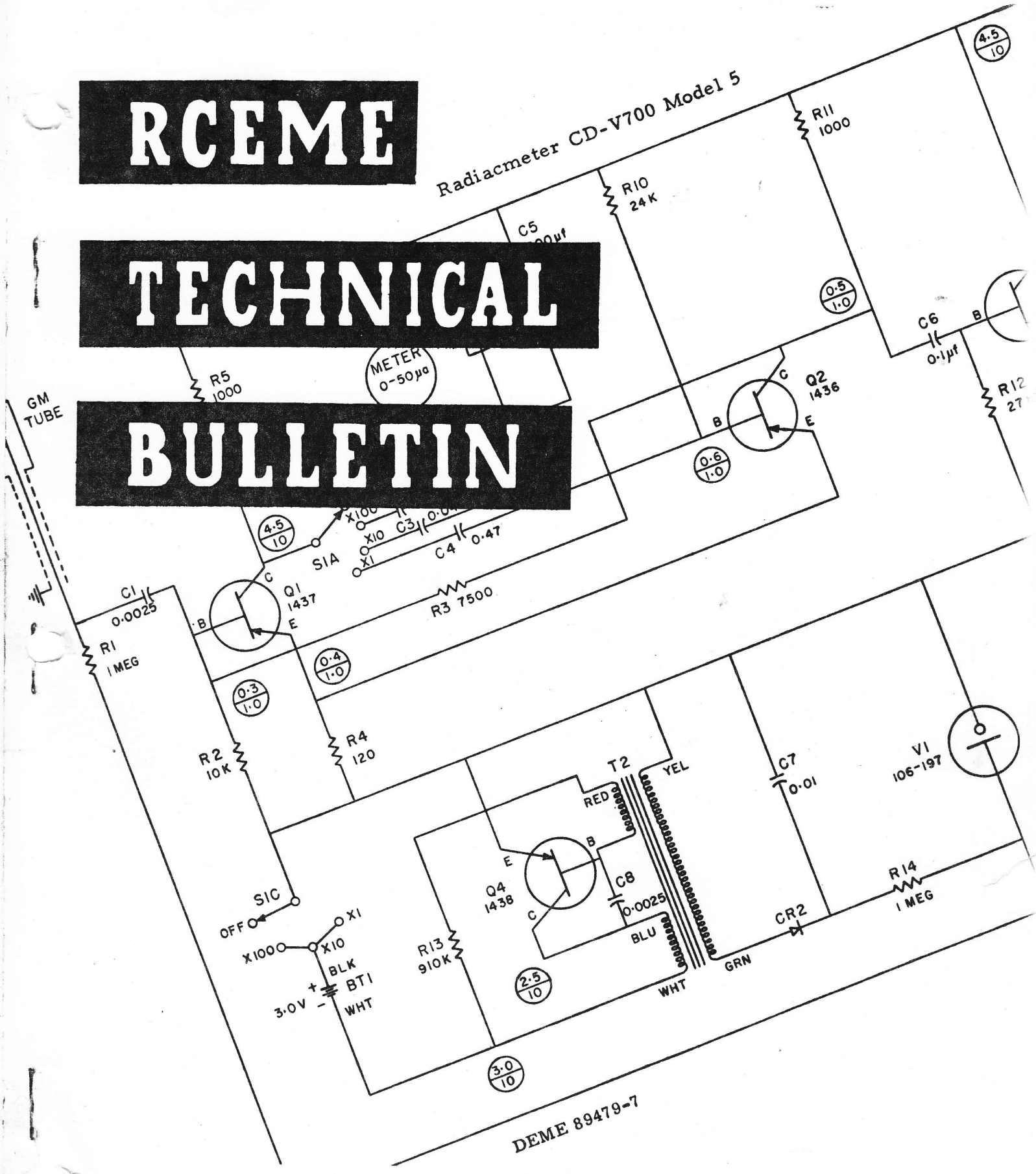
RCEME TECHNICAL BULLETIN



Volume 8, Number 2 *April 1963*

This Bulletin is published and distributed by the Director of Electrical and Mechanical Engineering as a means of periodically disseminating information on technical matters, current and future Corps policy, and items of general interest to the Corps of RCEME. It is not to be considered as authority for any action. Its contents should be made known to all interested RCEME personnel.

RCEME TECHNICAL BULLETIN

CONTENTS

Col CW Jones Retiring; Col GW Thompson Promoted	2
Radiation Safety and Health Physics	3
Maintenance of Radiac Equipment	8
Introduction to Critical Path Planning (Part 2)	9
Bisley Armourer	15
In Retrospect – Capt JG Wilkin MC	17
Birthday Celebrations	19
Training Notes	23
Technical Notes	27
RCE Memorial Scholarship Fund	30
How Does Your Organization Measure Up?	32
Technic Teasers	33
The Puzzle of Creativity	34
Curling	38
Theoretical Considerations of Repair in the Field	41
Who's Where – Warrant Officers 1 and 2	47

COVER: A portion of the circuit diagram of Radiacmeter Contamination CDV-700. It symbolizes the growing importance of both transistors and radiac in RCEME operations.

HOT NEWS?

Pardon the pun, but DON'T MISS the article on a new entry in the field of Industrial Management: "Radiation Safety and Health Physics".

This publication is issued under the authority of Col A Mendelsohn, CD, Director of Electrical and Mechanical Engineering. The contents have been edited and approved by Lt Col CMR Elmsley, CD.

The Bulletin is published to assist RCEME personnel in keeping abreast of current trends and developments and to circulate interesting news about the Corps. The information and statements herein are not to be quoted as authority for action.

EDITORS

Lt Col CMR Elmsley, CD
Mr DC Paterson

ASSOCIATE EDITORS

Lt Col	H	Goodfellow MBE, CD	Comd EME Western Command
Lt Col	WG	Hamilton MBE, CD	Comd EME Central Command
Lt Col	HM	Robinson CD	Comd EME Quebec Command
Lt Col	GT	Kirk MBE, CD	Comd EME Eastern Command
Col	GW	Thompson CD	CO 202 Base Workshop
Lt Col	WM	Dalrymple MBE, CD	CO 204 Base Workshop
Col	KR	Ward CD	Comdt RCEME School

EDITORIAL

HELP WANTED – Contributors and Critics

The Bulletin has these two crying needs.

We have a hard core of faithful contributors – a quick scan of, say, the last six issues, will identify them. To these, who have made the publication possible, we are grateful. Without them this "April" issue would not have made the press even at this late date – July. We do feel, though, that if the Bulletin is to fulfill one of its purposes – the cross-fertilization of RCEME thinking – we need a broader base than these few to draw on for material. The size, dispersal, and diversification of the Corps makes an exchange of ideas essential to the health of the Corps. For the same reasons, the Bulletin provides the best medium for the exchange. Again for the same reasons, there must be a wealth of ideas to exchange.

And so we come to the second need – criticism. We have, in writing the above, assumed that the Bulletin is read and does interest. But we have no evidence that this is so. Are the articles read? Do they cover subjects that are useful and interesting? Do you agree with the thinking? Are there other subjects you would like to see covered? How should we develop the Bulletin? Should we develop the Bulletin? And so on. We have no answers to these questions. Some constructive criticism would help.

We realize production of articles or criticism takes time and effort. We realize the only compensation we can give is the opportunity for you to express your ideas before a large and knowledgeable audience. We hope some of you will consider this compensation sufficient and give us the help wanted.

Without contributors the Bulletin will waste away and die. Without criticism, the Bulletin will lose its purpose.

COLONEL CAMPBELL WILLIAM JONES, CD

Born in Ottawa, December 2, 1910, Colonel Jones was educated at Nepean High School and Queen's University and was a mechanical engineer prior to the start of the Second World War.

He enlisted as a signalman in the 3rd Divisional Signals (NPAM) in 1926, and was commissioned in that unit in 1931. He joined the Royal Canadian Ordnance Corps (Active Force) as an ordnance mechanical engineer in 1939 and by 1941 was a captain overseas.

Recalled to Canada in November 1941 and promoted to the rank of major he served with the Inspection Board of Canada and the Directorate of Mechanical Engineering. In April 1948 he was sent to the United Kingdom to study modern armament equipment and later was appointed Assistant Director of Mechanical Engineering at Army Headquarters.

His appointment as Commandant of the RCEME School followed in August 1952.

Promoted to his present rank in January 1954, Col Jones was appointed commanding officer of 202 Base Workshop in August 1958.

COLONEL GEORGE W. THOMPSON, CD

Colonel G. W. Thompson was born in Barrie, Ont., and obtained his Bachelor of Science degree from Queen's University, Kingston, Ont. He enlisted in the Canadian Army in 1941 and went overseas in March 1942 with the 89th LAD of the 2nd Medium Regiment, RCA. He served with various RCEME units in Northwest Europe, and in April 1945 was commanding the 5th Canadian Infantry Brigade Workshop. He later held various appointments in the United Kingdom before returning to Canada in 1946.

He attended the Canadian Army Staff College in 1948, and in 1951 was appointed DADEME with the 27th Canadian Infantry Brigade in Germany. He was promoted to the rank of lieutenant-colonel in May 1952, and was appointed ADEME at Army Headquarters, Ottawa.

From 1955 to 1958 he was Command EME Central Command, Oakville, and from there went to the Canadian Army Staff, Supreme Headquarters Allied Powers, Europe.

He will be promoted to the rank of colonel and appointed commanding officer, 202 Base Workshop, on June 24, 1963.

RADIATION SAFETY AND HEALTH PHYSICS

By Capt AM Gilbert

Introduction

As a new and specialized responsibility in industrial management, health physics is concerned with the protection of man and his environment from the hazards of radiation and radioactive materials. The Radiation Safety Officer engages in the study of the problems and practices of providing radiation protection. He is concerned with methods and procedures of evaluating radiation hazards, with understanding the mechanisms of radiation damage, and with controlling radiation exposures. Broadly, health physics deals with all problems of protection from ionizing radiation, ie, radiological safety.

In order to understand the whys and wherefores of radiological safety, it is necessary to have an understanding of the term 'radiation' as applied to nuclear radiation. This article will endeavor to describe the three principal types of radiation to which one may be exposed in calibrating radiac equipment; to explain how they may affect a person; and to show what measures an individual may take to guard against unnecessary exposure.

First, however, let it be clearly understood that all safety devices, rules, regulations, SOPs, etc, will provide protection only if each person concerned does his part. Individual safety in nuclear work, as in any other kind of work, depends in large measure on the care exercised by the individual.

Servicemen are all familiar with safety devices and interlocks that are to be found on automatic washing machines, accessory contacts on ignition switches, machine shop equipment or transmitters. These are 'watch-dogs' to prevent unauthorized use of the equipments.

In many cases these devices can fail or can be deliberately bypassed. If they are bypassed for any reason, the margin of safety is decreased and the chance of being injured is increased. If a person should happen to touch a high-voltage circuit left unprotected as a result of bypassing, he would know about it immediately, perhaps by only a little tingle or perhaps by a jolt that could knock him down, or worse. Therein lies one of the great differences between electronic and nuclear work. In the latter field, by taking short cuts or by being careless, a person may be 'bitten' and not realize or know it for many months or years. He may have been careless only once, and that one instance may have passed completely from his mind before the results show up. The men and women who used to paint the numbers and hands of luminous watches would

twirl the paint brush between their lips in order to get a fine point, before or after it had been dipped in the radium solution. In the course of time these people became ill, and for a long time no one knew why because, at that time, the dangers involved in the use of radium salts were not known. As more and more is learned about radiation, more restrictions and limitations are placed on the use, storage, and transportation of radioactive material. To some people these restrictions are onerous; to others they ensure greater safety.

This article will be presented in general and broad terms, omitting much that is not of specific interest for this outline, but which could be of very great importance in other phases of nuclear work. As a result, the article is not all-inclusive, but it is hoped that it will be of sufficient scope to give some understanding of radioactivity and radiological safety.

RADIOACTIVITY

General

Most atoms are stable, that is, the positive electrical charge of the protons in the nucleus is exactly balanced by the negative electrical charge of the electrons orbiting the nucleus. Insofar as is known, stable atoms such as those of gold, carbon, sulphur, or tin, will last forever without change. They can enter into various chemical combinations, but these combinations do not change the atoms themselves. Other atoms, however, are unstable or radioactive (to use the technical term) since they contain an excess of internal energy. In the case of a naturally radioactive element such as radium, the excess energy was acquired by natural but unknown means. Some ordinarily stable elements may be made radioactive by bombarding them with atomic particles. Synthetic radioactivity may be produced deliberately by means of an atomic reactor or a cyclotron, or not so deliberately by an atomic bomb explosion. Whether natural or synthetic, radioactive atoms decay, or release their excess energy, sooner or later, in the form of radiation. Radiation, in turn, is the process by which radioactive elements become stable, and it is always present when energy is released.

Radiation Energy

Einstein stated that all matter could be equated as energy, either static or in motion. His equation is: Energy is equal to mass times the square of the speed of light ($E = MC^2$). It follows that an atom, containing electrons and protons, is held together with energy (binding energy) and that any change in the mass of the atom, either increase or decrease, will represent a change in the contained energy.

Whenever there is radioactivity, the radiation emitted must have energy. This energy is much smaller than the energy we are familiar with in everyday life. In electronics the unit volt is used to measure electromotive force; in nuclear physics a useful unit of measurement is an electron volt (ev), which is defined as the amount of energy that an electron will gain in passing through a potential difference of one volt. Much larger units are ordinarily used, such as kev and mev (thousands and millions of electron volts respectively). Alpha particles and gamma rays are both emitted with distinct amounts of energy depending upon the type of nucleus from which they are emitted. For most radioactive nuclides these amounts are accurately known. Beta particles, however, may be emitted with various amounts of energy up to the maximum energy which is characteristic of the particular radioactive nuclide in question. For example, beta particles with energy up to .53 mev (530,000 electron volts) can be emitted by strontium 90. As large as this figure may seem, it is small as compared with the energy (5.6 mev) of an alpha particle emitted from bismuth 214.

Radioactive Decay

Radioactivity decreases as radioactive atoms convert themselves into stable atoms. The term 'half-life' is used as a convenient measure of the rate of decrease of radioactivity; this term is used because the radioactivity is not released all at once but over a period of time. It simply means that a given

quantity of radioactive material will lose half of its activity in a certain period of time, half of what is left (one fourth of the original amount) in the next period, half of the remainder (one eighth of the original amount) in the third period, and so on. Eventually, the quantity remaining may become very small, but theoretically there will always be half of a remainder of the radioactive atoms which have not yet decayed. The half-life of different nuclides varies considerably, and may range from millionths of a second to millions of years. Some examples follow:

ELEMENT	SYMBOL	HALF-LIFE
Uranium	$_{92}U^{239}$	23.5 minutes
Neptunium	$_{93}NP^{239}$	2.3 days
Radium	$_{88}RA^{226}$	1622 years
Uranium	$_{92}U^{238}$	4,500,000,000 years

Types of Decay

Radioactive atoms decay in three principal ways, but the manner in which they decay can be learned only by observation. These three ways are by the emission of alpha particles, and gamma rays. In some instances there will be more than one type of emission from a single type of radioactive material.

Alpha Particles

An alpha particle consists of two protons and two neutrons, firmly bound together in a single 'package'. It is similar to a helium atom, less the two electrons. Since it does not have the two negatively-charged electrons to balance the positively-charged protons, it has two positive electrostatic charges with a specific energy value. When an alpha is emitted, a portion of the atom's binding energy is converted into kinetic energy in the motion of the alpha. Therefore particle emission contains the sum of two energies - electrostatic and kinetic. Emitted alphas have a lot of energy due to the two units of charge and the movement of the mass of four nuclides.

Beta Particles

Beta particle emission is another method of decay. Beta particles have a negative charge and a very small mass, and are like ordinary electrons except for the way they are formed. They are represented by the symbol 0, or $-B^{0}$, and are emitted from the nucleus of radioactive atoms with velocities varying from one-half to nine-tenths the velocity of light (186,000 miles per second). It is not known exactly how a beta particle is generated from an atomic nucleus, but its emission converts a neutron into a proton, and therefore results in the conversion of the radioactive atom into an atom of another element having one more proton but the same number of nucleons.

Gamma Rays

Gamma rays are not atomic particles, hence they have neither mass nor electrical charge; they are considered to be electromagnetic radiations, similar to X-rays but higher in frequency.

In the following, the word 'ionization' is used several times, so it will be considered first to see what it means. An ion is a particle with an excess or deficiency of electrons. Neutral atoms loose or gain electrons by:

a. collisions with beta particles - the beta becoming an orbital electron, and the atom becoming a negative ion;

b. electrons being torn from the atom by a strong positive charge, such as alphas passing near an atom. In this case the atom has become a positive ion, and the free electron is a negative ion;

c. the photo electric effect - the gamma photon collides with an orbital electron and forces the electron out of the atom. This is ionization caused by the atom absorbing the energy of the photon;

d. the Compton effect – a gamma photon interacts with an orbital electron in such a manner that only part of its energy is given to the electron. The photon suffers a loss of energy and is scattered as it ionizes the atom;

e. pair production – a high-energy gamma photon passes in the vicinity of a heavy nucleus, changing from electromagnetic energy into an electron and a positron (a particle of the same mass as an electron but with a positive charge).

This is a nuclear explanation of ionization. A chemical explanation of ionization describes the production of current in a battery and the production of light from a fluorescent lamp.

INTERACTION ON THE BODY

Now that it is known that radiation interacts with matter to produce ionization, the question is asked, "How does this affect the individual?" The answer to this question lies in the fact that everything in nature is made up of molecules of various combinations of elements, and that the basic building block of nature is the atom of an element. The individual is a walking mass of molecules – some simple, some quite complex – and as such can be affected by the action of radiation on their atoms.

Just as the atom is a basic building block, so also may the cells of the body be called "building blocks". In general terms, the body consists of a number of systems (respiratory, digestive, etc); the systems are composed of organs; and the organs are composed of tissues. Although these tissues may differ from organ to organ, all of them are composed of cells, and while cells may vary from tissue to tissue, all have some common features. Most cells have common components called the "cell membrane", the "cytoplasm", the "nuclear membrane", and the "nucleus". The cell membrane completely encloses the cell and is semipermeable; as a result, nutritional materials may pass into the cell and waste out of it. Radiation may affect the permeability of the cell. The bulk of the cell is the cytoplasm, composed of water, fats, proteins, and enzymes, which control the rate at which chemical changes occur to provide energy for body processes. This process, called "metabolism", is not usually affected by low doses of radiation. In the center of the cell is the nucleus, a protein-like material which is surrounded by the nuclear membrane. The nucleus seems to be the controlling center of the cell and is apparently the most sensitive to radiation.

The body is in a constant state of decay and repair. Some cells are dying while others are dividing in two to replace them. During this division, part of the nucleus called the "chromosome" seems to be particularly sensitive to radiation and, in general, cells which divide most rapidly have the greatest sensitivity. Therefore, an ionizing event in the cell nucleus may disrupt only the chromosomes, and the effects of this disruption may not affect the normal operation of the cell, but may be lethal to the nucleus when the cell tries to divide. In division the nucleus must essentially duplicate itself, so that the chromosomes must also be reproduced. Damage to their structure could prevent this.

Since a chemical reaction is simply the rearranging of electrons revolving around the nucleus of an atom, it may be said that anything that causes a change in orbiting electrons of an atom may affect the chemical reaction of the atom. Ionization occurs when an atom gains or loses an electron, and this can be considered a chemical reaction. With respect to human cells, then, ionization produced by radiation can cause a chemical reaction in those cells. Depending on the amount of ionization, greater or lesser chemical reactions can take place. The balance among chemical substances in the body is very delicate, and small changes in one place can cause large changes elsewhere. The end result of all these chemical changes is that the cells may become abnormal or die. If this happens to enough cells, the entire body will become ill; if still more cells are affected, the body may die.

It is beyond the scope of this article to discuss everything that could happen to the body through radiation. However, one question

sometimes hinted at, other times asked openly, seems to be of more than passing interest – that is, whether there is a possibility of sterility to those engaged in radioactive work. In answer to this question, it is believed that the amount of radiation required to produce permanent sterility would also be lethal. Except by accident (including radiation from a bomb), an individual would never be permitted to receive that much radiation, estimated to be about 600 roentgens over the whole body.

Radiological safety cannot be overemphasized in the handling of radioisotopes. There are many hazards involved if one is careless when working with radioisotopes, and of necessity there will be some absorption of radiation by the individual. However, the amount received will depend primarily on how well instructions are observed. In radiological work, directions must be followed from the beginning.

By regulation, those who engage in handling radioisotopes are not permitted to receive more than 1300 milliroentgens (mr) in any 13 consecutive weeks or 100 mr per 40-hour week – that is, uniform radiation from head to foot. This amount is believed to constitute an acceptable risk. The allowance for the forearms and hands is 1500 mr/wk because these extremities are far less critical with respect to radiation. However, they must not be deliberately exposed to radiation; consequently all nuclear work must be accomplished with as little exposure as possible. In working around nuclear radiation, ALWAYS wear a badge clipped to the belt or shirt.

PRACTICAL ASPECTS

The technician must be familiar with the regulations governing the use of radioisotopes. These are:

a. CAO 174 - 46

b. CAMT 2-69, "Safety", Chapter 12

c. EME Manual

Management V 400
Instruments A 251/4
Electrical G 002

The radiac reference sources that will be on distribution are C-2, C-3, C-4 and C-5. These are designed to meet the stringent requirements of industrial operations. However they are not foolproof and regulations must be enforced.

SUMMARY

The basic philosophy in radiological safety is to arrange the work and procedures so that the minimum amount of radiation is received while still getting the work done. Time, distance, and shielding are all-important factors in the amount of radiation received, and are interrelated. The less time spent in a radiation field, the less radiation received; the farther away from it, the less radiation received; and the more shielding between the individual and the material, the less radiation received. Each of these factors will be modified by the specific type of radioactive material encountered, but in a broad sense they hold true for all types of radioactive material. Finally, immaculate hygiene is the best protection against the ingestion hazard.

INDUSTRIAL ELECTRONICS

The electronic responsibilities in the Corps are increasing at a fast rate. Navigational aids, ultra high frequency communications and radiac instrumentation have been publicized as they progress.

In addition, industrial electronics have been added to the responsibilities of the master radio technician at BRIDGE and EASE sites. Much of the Engineer utilities equipment has electronics in each system, eg, boiler, generator, and airconditioning controls, and CO_2 detectors. These RCE equipments are normally serviced by local contract. However, to meet the operational requirement for self-support, the master radio technician will perform field repairs to the electronics in situ, after receiving special training.

MAINTENANCE OF RADIAC EQUIPMENT IN THE NUCLEAR DETONATION AND FALLOUT REPORTING SYSTEM

GENERAL

RCEME has been given the responsibility for the maintenance of radiac equipment in the Nuclear Detonation and Fallout Reporting System (NDFRS).

You students of CAMT 2-91 will recall that the NDFRS consists of Nuclear Detonation Reporting Posts (NDRP), Filter Centres (FC) and some 2200 Fallout Reporting Posts (FRP) widely dispersed across Canada. NDRPs report to FCs or to Provincial Warning Centres (PWC). FCs collect information from FRPs and report to PWCs. The system is designed to accurately report size and position of nuclear bursts and fallout radiation intensities to enable commanders to employ survival forces.

MAINTENANCE METHOD

A study was made to determine the most economical and satisfactory way of maintaining the equipment in the NDFRS, and it has been decided that RCEME technicians will be responsible for the radiac and communication equipment in the NDRPs and FCs and in those FRPs that are on DND camps and stations. The bulk of the FRPs will be maintained by civilian contractors operating under a RCEME administered contract.

Establishment action has been initiated to provide six corporal radio technicians and six vehicles for the calibration and maintenance of equipment at the NDRPs and the FCs. Because of the nature of the equipment, most of the repairs will be done in situ, and there will be a minimum of backloading to Area Workshops.

Calibration sources for use by these technicians and by the contractor are being manufactured at 202 Base Workshop.

Highlights of the FRP maintenance contract (subject to final approval and DDP action) are as follows:

EQUIPMENT

Dosimeters, stove pipes and radiacmeters (including spare batteries) now issued to approximately 850 FRPs (expected to increase to 1600 by 31 Mar 64), generally located below 50 degrees latitude in Quebec and Ontario, and 55 degrees in Western Canada.

SERVICES

Inspection and calibration of FRPs now operating will be completed semi-annually. Those which become operational in 63/64 will be done on installation of instruments and thereafter semi-annually.

Repairs will be on site or exchanged for later repair, either when found unserviceable by the inspector or at the request of RCEME.

PARTS AND MATERIALS

All parts including replacement batteries will be provided as a free issue. The contractor will provide RCEME with a record of parts used and will return major items to RCEME if beyond repair.

INSPECTION

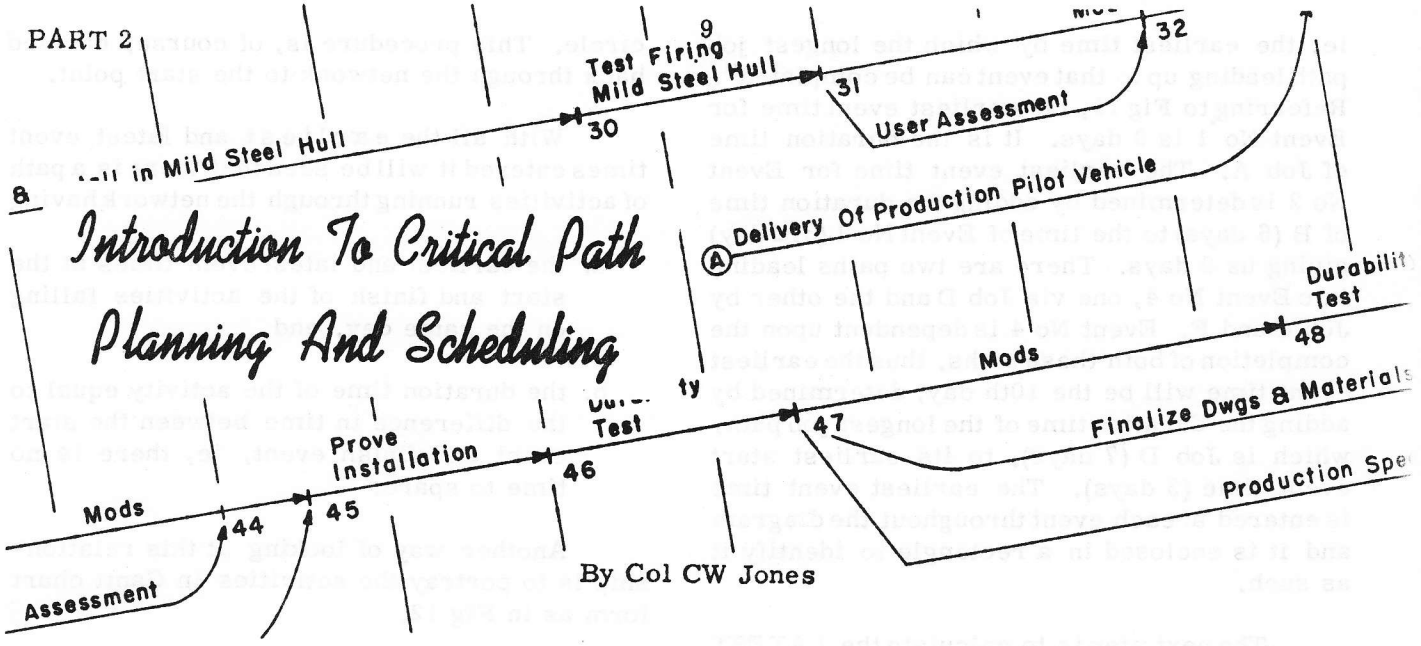
Inspection will be to the satisfaction of RCEME COs. (It may be necessary to request Inspection Services DND assistance for the contractor's base repair facility).

GENERAL

The contractor will supply all test equipment except Radiac Point Calibrators C-2 and Reference Sources C-4 (when available).

PART 2

Introduction To Critical Path Planning And Scheduling



By Col CW Jones

In the last article we introduced critical path planning and scheduling and, after discussing the various types of arrows and their numbering, we outlined the procedure for developing a plan in the form of an arrow diagram.

The next step in the procedure is to consider the scheduling. This will enable us to determine when an activity or job should start and, since we know its duration time, when it will be completed. By studying these times as applied to our arrow diagram, it is a very simple matter to establish when we have time to spare and to identify those jobs which will govern the completion time of the project. The sequence of jobs in the arrow diagram usually produces various paths through the diagram and the time required to complete any one path is determined by totalling the times for each of the jobs along that path. The path through the diagram having the longest time will be the one that controls the completion time for the whole project and this path is described as the "critical path".

To develop the schedule, the first thing to do is to apply the duration times and it is stressed here that, as in any schedule, the accuracy of the answer obtained by critical path can be no greater than the accuracy of the elements which are combined to produce it. It is therefore necessary to apply all available knowledge of past experience, coupled with that of known resources such as manpower, equipment and materials in order to produce a realistic "normal duration" time. Once the normal duration time is established, it is entered on the arrow diagram, alongside the arrow representing the particular job.

* Fig 11 is an arrow diagram representing a project with the duration time in days for each job entered alongside the appropriate arrow. In this diagram, the arrows are also given an identifying letter (in actual practice it is normal to write a short description of the activity alongside the arrow).

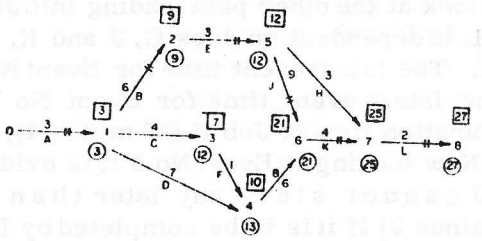


Figure 11

The network now completed with identification and duration times entered, we are ready to determine the EARLIEST EVENT TIME. This has been described as "the earliest time at which a given event could occur,

* Figure numbers in this article are continued from Jan installment.

ie, the earliest time by which the longest job path leading up to that event can be completed". Referring to Fig 11, the earliest event time for Event No 1 is 3 days. It is the duration time of Job A. The earliest event time for Event No 2 is determined by adding the duration time of B (6 days) to the time of Event No 1 (3rd day) giving us 9 days. There are two paths leading into Event No 4, one via Job D and the other by Job C and F. Event No 4 is dependent upon the completion of both these paths, thus the earliest event time will be the 10th day, determined by adding the duration time of the longest job path, which is Job D (7 days), to its earliest start event time (3 days). The earliest event time is entered at each event throughout the diagram and it is enclosed in a rectangle to identify it as such.

The next step is to calculate the LATEST EVENT TIME and this has been described as "the latest time by which a given event can occur, ie, the latest time by which the longest job path leading out of that event must start, if subsequent jobs are not to be delayed". This is determined by working back from the finish time. Referring once again to the arrow diagram in Fig 11, it will be seen that the latest event time for Event No 7, the latest time at which Job L can start if it is to be completed on Day 27, will be the finish time less the duration time of Job L (27 minus 2), – Day 25. It is to be noted in this case that the earliest and latest event times occur at the same time. To carry on and follow the path through Job H to Event No 5, we would in this manner establish its latest event time as Day 22, but we must also look at the other path leading into Job L as Job L is dependent on Jobs G, J and K, as well as H. The latest event time for Event No 6 will be the latest event time for Event No 7, less the duration time of Job K (25 minus 4), or Day 21. Now looking at Event No 5 it is evident that Job J cannot start any later than Day 12 (21 minus 9) if it is to be completed by Day 21. This would make the latest event time for Event No 5 Day 12 rather than Day 21, which was reached by Job Path H. The latest event time for each event is established in this manner and is entered on the diagram next to the event number and is identified by enclosing it in a circle. This procedure is, of course, carried back through the network to the start point.

With all the earliest and latest event times entered it will be seen that there is a path of activities running through the network having

a. the earliest and latest event times at the start and finish of the activities falling on the same day, and

b. the duration time of the activity equal to the difference in time between the start event and finish event, ie, there is no time to spare.

Another way of looking at this relationship is to portray the activities in Gantt chart form as in Fig 12.

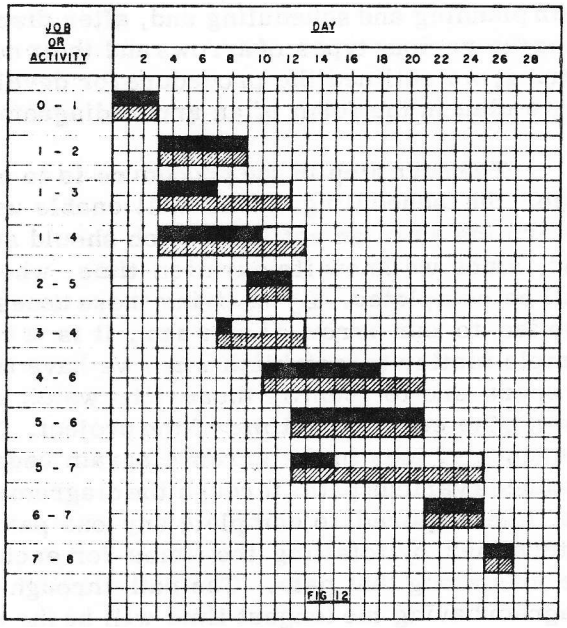


Figure 12

In this chart the black line represents the activity duration and the cross-hatched lines the time available between the earliest start event time and the latest finish event time with each square representing a period of one day.

In studying the chart it is immediately evident that the duration time of Activity 0-1 is equal to the time available between its earliest start event and its latest finish event time. A similar situation obtains in relation to Activities 1-2, 2-5, 5-6, 6-7 and 7-8. If we identify these arrows, as we have in Fig 11, with cross-hatches it will be seen that they form a continuous path through the project network. This is described as the CRITICAL PATH. It is critical because we cannot alter the starting line or duration time of any of these activities without producing a resultant effect on the completion time of the last event, No 8 in this case.

Now looking at the remaining activities 1-3, 1-4, 3-4, 4-6 and 5-7, it will be noted that their duration times are somewhat less than the times available between their earliest start event and latest finish event times.

In Activity 1-3 it will be noted that the activity duration time is only 4 days, while the time available between the earliest start event and the latest finish event is 9 days, thus there are 5 days to spare after the activity is completed. In this instance the activity start time is coincidental with the earliest event time; we can, however, arrange to have the activity reach completion at the latest finish event time (this situation is portrayed in Fig 13) by delaying the activity start time until Day 8 in which case our free time would precede the activity.

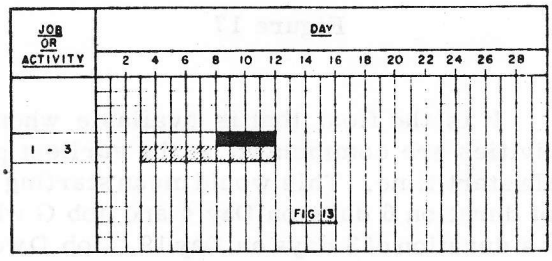


Figure 13

We can, in fact, start the activity on any day from Day 3 to Day 8 and still not affect the date of completion of the overall project.

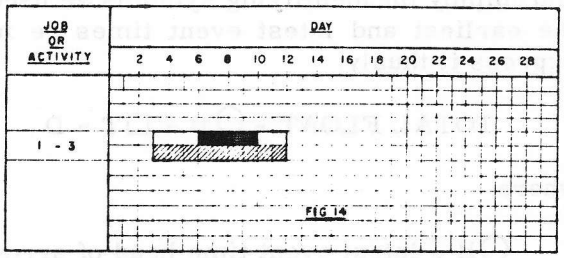


Figure 14

In a further example shown at Fig 14, the activity start time has been set at Day 6, which results in the activity finish time occurring on Day 10, thus there is free time both before and after the activity period. This spare time that we have noted to be associated with these latter activities is described as FLOAT. Its judicious use by management will pay dividends, while its neglect might result in its dissipation with its associated activity immediately becoming critical, thus necessitating a new plan.

The degree of usefulness of this float is dependent on its relationship with its own and adjoining activities in the network. To identify this relationship, float has been placed in four different categories in order to better ensure its most useful employment. These four categories are TOTAL, INTERFERING, FREE and INDEPENDENT FLOAT.

The relationship of these various categories is best portrayed graphically and we will refer to Activity 1-3 of Fig 12 to study the TOTAL FLOAT. In this case we note that there are 9 days between the earliest start time, Day 3, and the latest finish time, Day 12, in which the job can be completed but the job duration is only 4 days so we have 5 days to spare. These 5 days are the total float. To define it: "Total float for any activity is the total time available to do the job, less the duration time of the job itself".

To calculate total float it is only necessary to subtract the duration time from the difference between the earliest start event and

latest finish event time. To use a "gimmick" and employ the identifying symbols we used for the earliest and latest event times we might express it thusly:

TOTAL FLOAT = ○H - □T - D

where

○H = latest event time head of arrow

□T = earliest event time tail of arrow

D = duration of activity

The relationship of Jobs D and H of Fig 15 below will be used to introduce INTERFERING FLOAT.

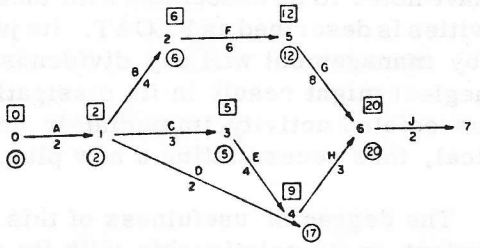


Figure 15

In this network Job D of duration 2 days can start as early as Day 2 and finish as late as Day 17 giving a total time available to do the job of 15 days of which 13 days are the total float. Job H of duration 3 days can start as early as Day 9 and finish as late as Day 20, thus giving a total time available of 11 days, 8 days of which will be the total float. If H however is started at its earliest date it would use up 8 of the 13 days available to Job D. This is known as an interfering float and is portrayed graphically in Fig 16.

It can be defined as "that part of the total float which may be absorbed by an associated activity when the times available for the two activities overlap". It is determined for any given activity by subtracting its earliest finish event time from its latest finish event time. Employing the symbols we have:

INTERFERING FLOAT = ○H - □H

where

□H = earliest event at the head of arrow

○H = latest event at the head of arrow

FREE FLOAT can be demonstrated by the two Jobs D and G of the network in Fig 17.

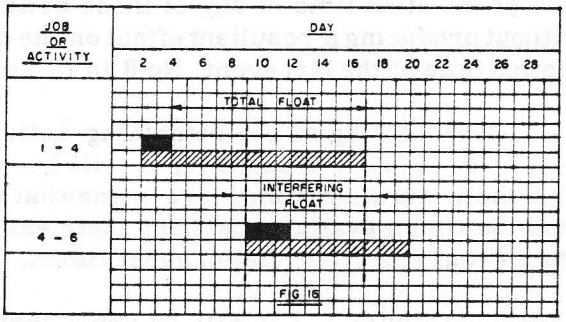


Figure 16

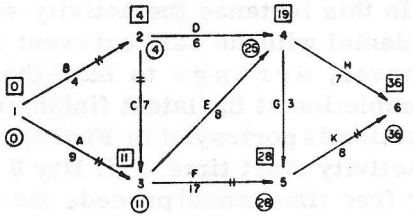


Figure 17

It is the float that is available when all activities are commenced at the earliest possible start time. This would mean starting Job D of duration 6 days on Day 4 and Job G which has a duration of 3 days on Day 19. Job D would therefore be finished on Day 10, 9 days before Job G could start. This is shown graphically in Fig 18, and it may be defined as "that portion of the total float which remains after any interfering float has been deducted".

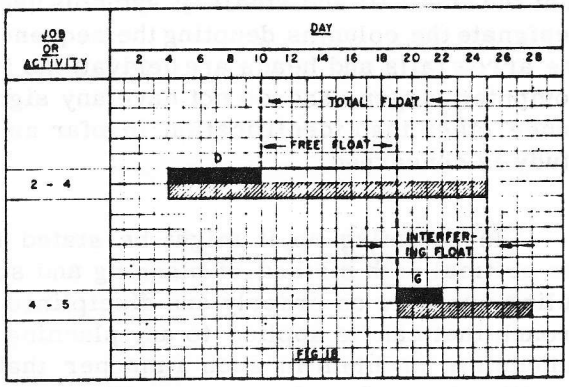


Figure 18

It is calculated by subtracting the job duration time from the difference between its earliest finish event time and the earliest start event time. Reverting to our "gimmick" we have:

$$\text{FREE FLOAT} = \square H - \square T - D$$

where

$\square H$ = earliest event at tail of arrow

$\square T$ = earliest event at head of arrow

D = duration of activity

Finally, any float that remains when all the activities before a given job are started as late as possible and the activities following the job are started as early as possible is described as INDEPENDENT FLOAT.

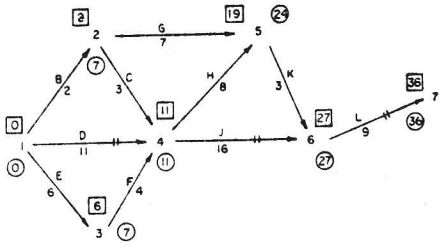


Figure 19

Looking at Job G of Fig 19 we see that it has a duration of 7 days and that the total time available to complete the job is 22 days. Its total float is therefore 15 days. Even if we delay completion of Job B to its latest finish event time of Day 7 and start Job K at its earliest start event time of Day 19 there will still be 5 days float remaining for Job G. Its start time can be varied within these 5 days without interfering with any other job. This is shown graphically in Fig 20.

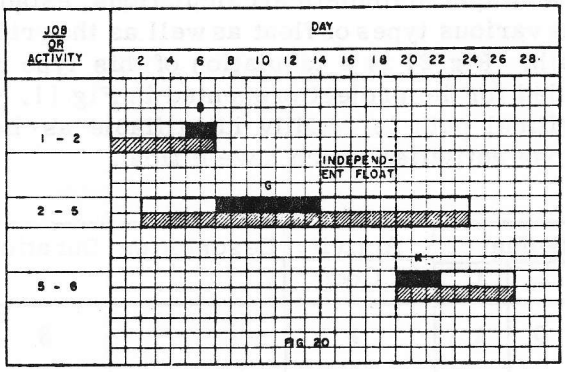


Figure 20

It is calculated by subtracting the job duration from the difference between its earliest finish event time and the latest start event time. Using our symbols we have:

$$\text{INDEPENDENT FLOAT} = \square H - \bigcirc T - D$$

where

$\square H$ = earliest event at head of arrow

$\bigcirc T$ = latest event at tail of arrow

D = duration of activity

This completes the theory of critical path planning based on normal duration times. The more involved studies of "crash" times and the relationship of crash programs and increased costs, as well as the manpower levelling studies are considered beyond the scope of this presentation.

Normally when a computer solution is to be employed for a project it is only necessary to complete the arrow diagram, number it and

add in the normal duration times. This information is tabulated and punched out into cards which are fed into the programed computer and the output provides a tabulation of all data beyond that, ie, earliest and latest start and finish times as well as total, free and independent float. The critical path, of course, is readily identifiable by noting those jobs with no float.

If the project is not too vast it is quite practical to tabulate the information provided by the completed diagram manually and with a few simple arithmetical calculations, establish the various types of float as well as the critical path. Fig 21 is a tabulation of this type provided for the project presented in Fig 11. The critical path is readily identifiable as being those activities which have 0 float.

It might be noted in the above diagram that the small 'i' and small 'j' symbols used to designate the columns denoting the sequence of the arrow tails and heads are derivations from computer jargon, and do not have any significance other than identification insofar as this study is concerned.

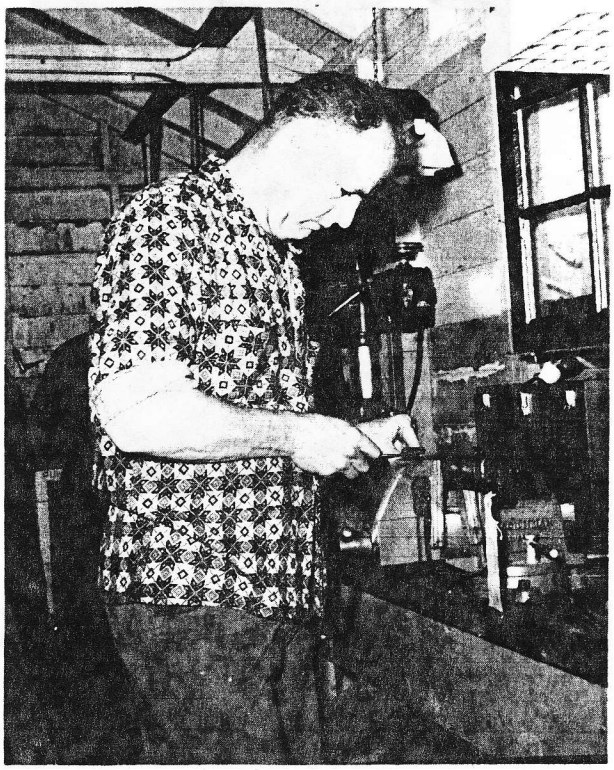
In summing up, it might be stated that the critical path method of planning and scheduling presents an orderly and disciplined approach that can be applied to any planning and scheduling problem in such a manner that all ramifications of a plan are readily grasped, thus enabling management to isolate and concentrate on those stages of a project that are critical and govern the overall completion time.

Sequence		Activity Code	Description	Duration	Earliest		Latest		Float		
i	j				Start	Finish	Start	Finish	Total	Free	Indep
0	1	A		3	0	3	0	3	0	0	0
1	2	B		6	3	9	3	9	0	0	0
1	3	C		4	3	7	3	12	5	0	0
1	4	D		7	3	10	3	13	3	0	0
2	5	E		3	9	12	9	12	0	0	0
3	4	F		1	7	10	12	13	5	2	0
4	6	G		8	10	21	13	21	3	3	0
5	6	J		9	12	21	12	21	0	0	0
5	7	H		3	12	25	12	25	10	10	10
6	7	K		4	21	25	21	25	0	0	0
7	8	L		2	25	27	25	27	0	0	0

Figure 21

BISLEY ARMOURER

By Sgt WJ Ryan



The author in 'uniform' at work on a competitor's rifle in the armourer's shop at Connaught Ranges

When an armourer attends the Dominion of Canada Rifle Association and Ontario Rifle Association competitions at Connaught Ranges, Ottawa, he requires all the experience on No 4 rifles that he can muster – and then some.

His work will be mostly bedding by a modified regulation method on the No 4 rifles (with or without the 'hung' trigger system.) Through years of experience at Ottawa this has been brought to a fine art. Now that center bedding is becoming popular it will be necessary to know how to master this tricky set up. Then there is the modified No 4 rifle with the 7.62 mm barrel, which will be appearing at Ottawa in the competitions this year. More problems can be expected from this rifle, so one can readily understand the need for a training period at Ottawa, and the realization that having a knowledge of the work, and doing it, are two different things. He will become aware of this after his first 20 hours at a workbench, because the work comes in fast, and the headaches come faster.

The competitors arrive a day or so before the meet opens and the first place they head for is the Armourer Shop. There could be up to six hundred competitors for both meets, and a lot of them will have had little work done on their rifles since the competitions of the year before. Everybody will be in a hurry to have a major overhaul of his rifle, so you have no time for trial and error methods; you have to know just what is required to do the job properly. And the best way to find this out is to ask, and ask I did. WO 1 Howie Keech and S sgt Bill O'Rourke have a wealth of knowledge; both have had many years at the DCRA meets and Bill has been twice to Bisley as armourer.

It has been the practice to consult as a group on the best methods of doing the particular jobs. Last year we had the experience of S sgt Ken Sheppard who had previous experience on center bedding and had attended Bisley also. In addition we had Cpl John Watt who will be attending Bisley this year and Cpl Ron Switzer who had worked on a center bedding program for WO 1 Keech at Ottawa. With an open mind one cannot help but do well with this kind of experience to draw from.

I can say from my experience that two or more years working at these competitions is necessary in preparation for Bisley, England. Not only do the shooters get to know you, but you gain the confidence and the know-how necessary to satisfy these competitors: With-

out this ability they will ignore you like the plague.

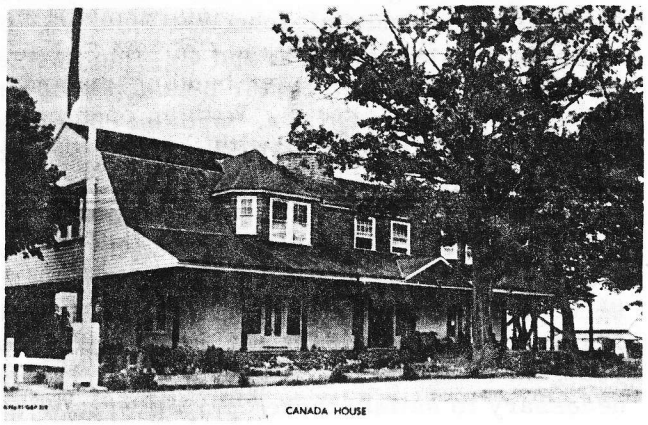
BISLEY

When asked to go to Bisley with the DCRA team, I felt confident and ready to do a good job. The warm-up period at 202 Base Workshop just before leaving Canada, preparing the rifles for the Cadets and members of the DCRA Team was another opportunity to show my ability and get a lot of work done. This made things easier for everyone concerned.

Some competitors had an opportunity to try out their weapons to their satisfaction and this lets the armourer rest and enjoy his trip across to England with the knowledge that he has the best part of the battle won. The shooters find themselves in a more positive frame of mind, knowing that their equipment is in good repair ready for practising immediately on arrival. So relations with the shooters are on a friendly basis and are not so demanding, making the trip better for all.

The trip overseas by plane was long but as comfortable as could be expected. The accommodations at Bisley are good although it is advisable to take warm clothing.

While the Bisley competition is on you are expected to take care of the rifles of the DCRA-, Army-, and Cadet teams, with the DCRA team the top priority. This is where the work done in Canada, in preparation for the meet, is appreciated. It leaves you more time



CANADA HOUSE

An "enjoyable" welcome home

to attend to the jobs at hand which in most cases will be 5 lb 1 oz trigger pulls and some last-minute adjustments to beddings.

My trip to England was enjoyable. I met and made new acquaintances with members of the Canadian Teams, and I was able to talk to armourers of other teams attending the Bisley Meet and exchange practical information with them. I was given some opportunity to travel in England during my leisure time, unfortunately all too short, and this was an experience in itself.

To know that your efforts had contributed to some of the success attained by the Canadian teams made all the hard work rewarding and the return trip with the welcome home to Canada a more enjoyable one.

I hope that the future armourers who attend the Bisley competition have the same opportunity to work along these lines so as to make his trip a success.

Canada House, Bisley, where the Canadian Bisley teams stay

IN RETROSPECT

The Award of the Military Cross to Captain John Graham Wilkin Officer Commanding, 53 Light Aid Detachment attached to the 2nd Canadian Armoured Regiment Lord Strathcona's Horse (Royal Canadians)

Captain John Graham Wilkin, MC, P Eng
Manager
Salary Administration Services
Hydro Electric Power Commission
of Ontario

By Lt Col RH Hodgson CD

In writing about the clearing of the Senio Line, Colonel CP Stacie recorded in his The Canadian Army 1939-1945 that "There remained for the Canadian Forces one more formal operation in 1944 – the final advance to the Senio River".

In a space of less than two miles the 1st Canadian Corps front (10-11 December 1944) was crossed by three dyked water courses – the Fosso Vecchio, the Canale Naviglio and the Fosso Munio – while on the right the Fosso Vetro, just east of the Vecchio, was a fourth obstacle in the path of the 5th Canadian Armoured Division.

After an unsuccessful attempt to push forward on the 18th of December another try was made on the evening of the 19th. Enemy resistance along the water Barriers checked initial progress. The Engineers were called upon to bridge the Fosso Munio. In describing these events in his The Canadians in Italy, Colonel GWL Nicholson wrote: "By great misfortune... a bridge put in by the Engineers during the darkness was found to be at a bad angle, so that vehicles could not pass. A facine was rushed forward and armoured bulldozers began filling the canal, but by the time this crossing was ready the site had attracted the attention of every enemy weapon within range – one observer estimated the rate of fall of artillery shells in the area to be 150 per minute".

Captain Wilkin's citation records this incident in detail: "The bridge was launched, but before taking tanks across Captain Wilkin,

commander of the 53rd Light Aid Detachment, went forward on foot and examined the bridge and found that it had been launched at such an angle that it was impossible for tanks to use it. He immediately informed the Engineers who completed the fill with an armoured bulldozer".

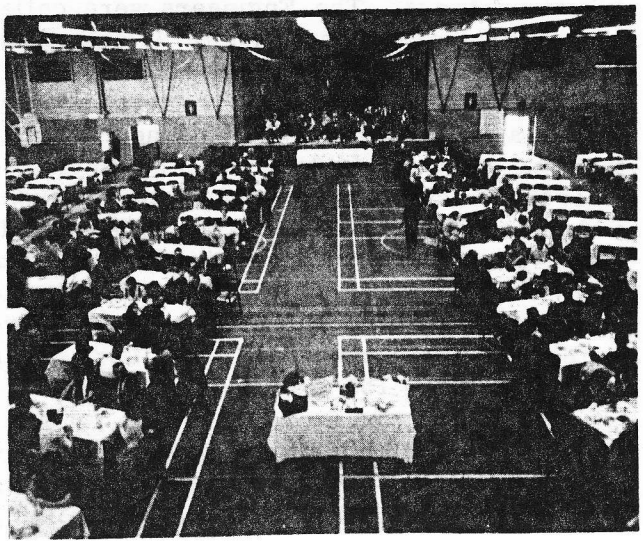
The enemy fire was so heavy that two M10 self-propelled guns, one D6 bulldozer and one tank were destroyed within a radius of two hundred yards of the bridge site. The citation continues: "Owing to the heavy concentration of fire that was brought to bear on the crossing and beyond, it was decided to put fighting tanks across first to assist the Perth Regiment. A troop of tanks was ordered to cross. The first two succeeded but the third tank bogged down in the fill, completely blocking the route and preventing any further crossings.

"Captain Wilkin taking stock of the situation realized that the immobile tank could not be removed by his recovery tank. He therefore arranged for the use of a nearby armoured bulldozer. He then dismounted from his recovery tank with two of his men. They went forward on foot under heavy fire dragging with them the heavy recovery cables to the stranded tank and the armoured bulldozer. He then directed the winching of the tank clear of the crossing".

This action by Captain Wilkin, taken in the face of heavy enemy shelling was directly responsible for the clearing of the crossing and ensured the passage of the supporting arms which were essential for the holding of the Perth Regiment bridgehead.

"Reflecting on the events surrounding the Fosso Munio crossing" wrote Mr Wilkin, "I must say that I have never felt that my efforts that day warranted a medal. I will admit that they aided substantially in clearing the crossing, but I was doing no more than the job which I had been assigned to do. Many men did far more, under worse conditions, and received little or no recognition.

"I think the greatest satisfaction that I have derived from those events was the knowledge that I could carry on under fire in a satisfactory manner, and do my share in an overall group effort. The award of The Military Cross to me signified the appreciation of those higher up for a good effort. I am glad that I was able to be of service to a "Top" division in which I had a good deal of pride... In any event I had excellent support from my own men (some of whom accompanied me during the most dangerous parts of the job), and from the supporting service arms".



PLENTY AT BIRTHDAY PARTY

RCEME CORPS 19TH BIRTHDAY OPEN HOUSE

By Mr L West, 202 Base Workshop

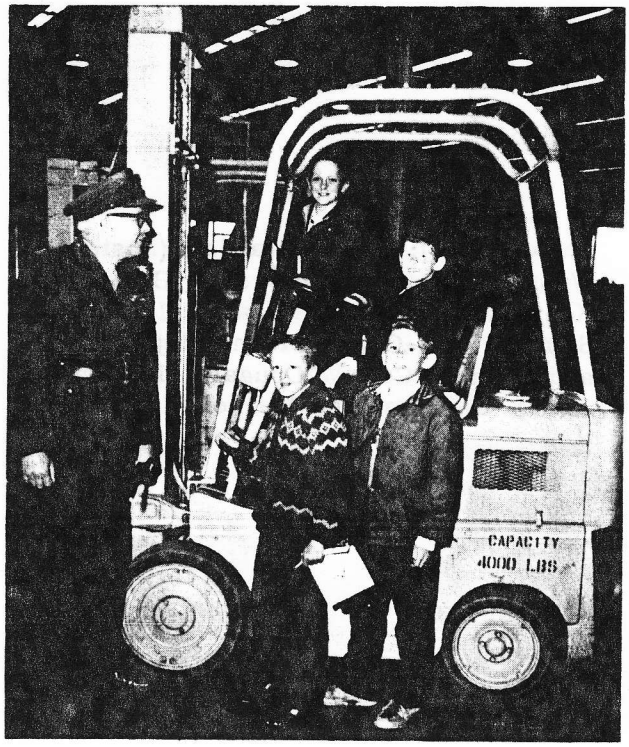
On Saturday, 11 May 63, 202 Base Workshop RCEME opened its doors to all its members, families and friends to commemorate the Corps' 19th Birthday. All personnel assisted in preparing for the visit and were enthusiastic at the thought of showing their own family and friends their particular work and that of their associates.

Approximately 1200 people were welcomed by Colonel CW Jones and Mrs. Jones. Dolly trains were used to convey people from place to place in order to allow everyone to see the size and scope of the workshop. Markers and signs were displayed and all were free to move at their own pace. Guides were located at strategic points to explain the role of operation of equipments from the simplest mechanical item to the Centurion tank and radar. Each person received a souvenir and program as a memento of his visit.

Photographs and TV further enhanced the visit with several minor Elizabeth Taylors and Rock Hudsons jockeying for camera positions. The culmination of the visit was a sit-down turkey dinner with all the trimmings, held in the Drill Hall and arranged at a nominal charge through the courtesy of the messing officer and his staff.

The RCOC Band in attendance under the direction of WO 1 Lambert played throughout the dinner hours. Some lucky ladies were winners of door prizes which added to the enjoyment. All guests expressed delight and some amazement at the operations and organization of the workshop.

The RCEME Corps is justly proud of its achievements and gained added recognition as a courteous, hospitable host. It is hoped by all that the Commanding Officer will see fit to authorize an open house again in the future.



Colonel Jones and friends

Dolly train passing Centurion tank

CORPS BIRTHDAY IS CELEBRATED IN ENGLAND

By Lt-Col AGM Maitland

The 3rd of May 1963 was the occasion for a RCEME Birthday Party at the home of Lt-Col and Mrs AGM "Bud" Maitland in Purley, Surrey, which was attended by some of the RCEME officers and their wives stationed in England and several visiting officers from Canada and Germany. The date, which was twelve days prior to the official Corps birthday, was selected as the Maitlands were leaving for France on May 10th, but it coincided, luckily, with the visit to London of Lt-Col AL Maclean and Capt JD McDougall of DEE. Unfortunately Major WR Willing, who was also in London, had another engagement and was unable to be present.

In addition to the visitors from Canada, the party was attended by Major HW Chapman, CO 4 Fd Wksp, Germany, who was on course at the REME School, Arborfield, Major and Mrs JJ Garnett from Arborfield, Major and Mrs EG Jones, Major and Mrs VD Kenyon, Major and Mrs ALD MacDonell, and Major and Mrs M Ruscher. Lt-Col and Mrs WJ Owens, stationed at RMC of S, Schrivenham, were unable to make it and the limitation on numbers did not permit extending invitations to the various RCEME officers on course at RMC of S.

Highlight of the evening was the cutting of the birthday cake, decorated in Corps colours and surrounded with a recovery vehicle and other military pattern vehicles, by Lt-Col Maclean who was the senior officer present. Even by RCEME standards it was an excellent party, as all present agreed when they said goodbye in the small hours of the morning.

CUTTING THE CAKE

Seated (l to r): Eleanor Maitland (hostess) Wynn Ruscher, Jean Garnett, Bonnie Kenyon, Marg Jones and Sandy Macdonell. Standing: Lt-Col Maclean, Maj Ruscher and Garnett, Capt McDougall, Maj Kenyon, Jones, Chapman and Macdonell.

-Photo by Maitland

GROUP JOINS BIRTHDAY PARTY

UNEF Base, Rafah, Egypt - The 16-member CBC concert party has settled into this sprawling desert army camp like the veterans they are - show business veterans rather than military.

In the next two weeks, the entertainers under CBC organizer Ken Dalziel, will live and eat with 950 soldiers and airmen of the Canadian contingent as they perform for more than 5000 troops of the seven-nation peace force in the Gaza Strip and Sinai desert.

Singer Tommy Common, a headliner with the variety revue, expressed the general feeling of the group when he said, "It made me feel good as a Canadian to see the friendliness and attitude of our soldiers so far away from home."

Wednesday, the performers went to a party as the 145 members of the Royal Canadian Electrical and Mechanical Engineers stationed here celebrated the 19th birthday of their corps.

The celebration highlights came after lunch when the RCEME soldiers paraded through the Canadian base camp in "outlandish" vehicles headed by their commanding officer, Major Doug Tidy of Toronto.

Later, in a tug-of-war on the sandy beach, the soldiers had the moral and physical support of French-Canadian singer Claudette and singer-dancer Agota Gabor. The girls split up, one on each side of teams of craftsmen versus officers and senior NCOs. In two out of three hauls the men captured the event. The girls, who had alternated from team to team, paid the penalty of losers, along with officers and NCOs, of being carried aloft and dumped into the Mediterranean.

The fast-breaking waters also claimed Tommy Common, vibes-player Peter Appleyard, pianist Lloyd Edwards and other CBC radio and TV performers as they, in turn, were dumped into the sea by the soldiers. Afterwards, ragtime pianist Alec Read, who is master of ceremonies of the concert party, lead his fellow-entertainers in a tribute to the RCEME by singing 'happy birthday'.

Thursday night, the entertainers put on their first of 13 performances of "Canada Entertains" before the 700 members of the Swedish battalion in the pre-Biblical town of Gaza. Adding to the calibre of the entertainment is the setting - a large outdoor stage with the blue waters of the Mediterranean as a backdrop.

A DIFFERENT BIRTHDAY PARTY

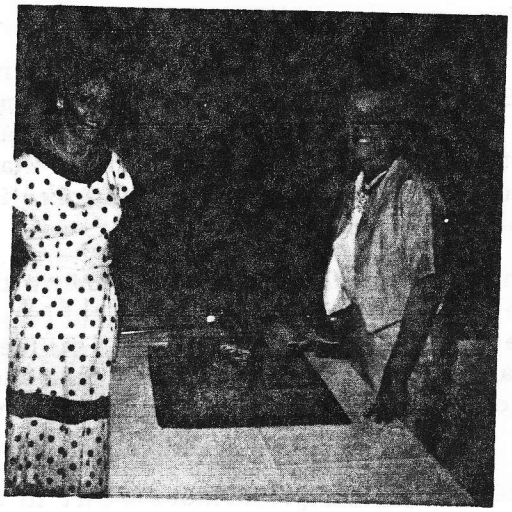
The 19th RCEME Birthday Party at CJATC was one to remember. The attendance of 223 included a variety of corps and services. Men from no less than eight corps attended, plus all RCAF members of CJATC who were formerly employed by the RCEME Army Aircraft Maintenance Unit. They had requested tickets to the last man! The plan of having senior officers from all three services as well as a live horse was marred somewhat by the RCN officer becoming indisposed at the last moment. (Not what you think - he had a toothache) The horse did fine.

The party saw twist demonstrations by the younger set and a trick bicycle rider who didn't seem to know when his act was over.

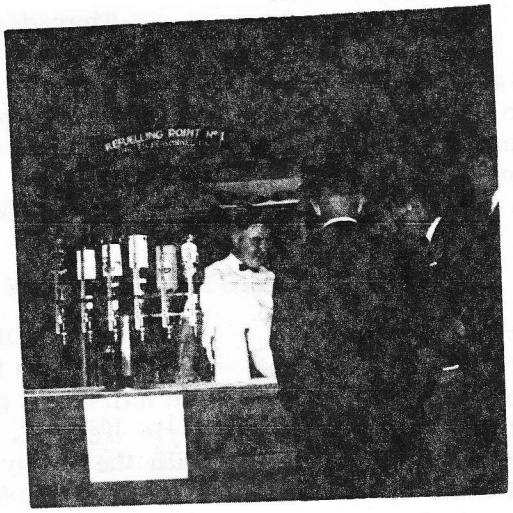
The ceiling was decorated with a cargo parachute 100 feet in diameter in the center of the hall which provided very effective cabaret-style lighting. Cartoons decorated the walls with the Army helicopter support of the Hay River flood rescue as the main theme. (What? You didn't know we were there?) A 2 RCHA orchestra which had been booked one year in advance provided the music.

A serious note was struck when a plaque was presented to Mr Monte Metcalf, Hiller Company Field Service Representative, for "many long hours of patience and understanding" during the two years with RCEME at CJATC. His stay with us terminates 30 Jun 63.

2 RCHA Band



Mrs Gardiner Mrs Sweeney



Refueler L/Cpl RM Fraser

Honored Guest

RCEME at Peace

Training Notes

RCEME UNIT RADIATION SAFETY OFFICERS AND NCOs

Over the past ten to twelve years, a number of RCEME officers and NCOs have attended various NBCW courses. Some of these courses led to a qualification of Unit Radiation Safety Officer or Unit Radiation Safety NCO.

A recent decision has been made that this qualification will be recognized only for a period of three years from the date of qualification unless:

a. the man has been employed at this duty in which case no time limit is set, or

b. the time since last employed at this duty does not exceed three years.

According to DEME records, the following officers and NCOs are considered qualified:

a. Radiation Safety Officers	Date qualified
ZK 1126 Lt Col JC Currie	1961
ZL 486 Maj CG Lawrence	1962
ZB 3166 Maj B Yarymowich	1961
ZL 3196 Maj LH Love	1961
ZB 3489 Maj EG Jones	1961
ZA 7059 Capt RE Goulding	1961
ZP 4897 Capt V Roddick	1961
ZB 6207 Capt MG Masuda	1961
ZC 5345 Capt RB Screaton	1960
ZP 6144 Capt JMF Bourassa	1961
ZF 3282 Capt WJA Groom	1961
ZD 9362 Capt TM Mimee	1960
ZB 6735 Capt NA Graham	1962
ZA 4896 Capt AM Gilbert	1953

b. Radiation Safety NCOs	Date qualified
SB 69665 WO 2 Griffin GW	1962
SC 52793 WO 2 Smith SE	1962
SG 9611 S Sgt Dunham RD	1960
SC 6643 S Sgt Prentice MP	1960
SK 14254 S Sgt Linge HL	1960
SB 801853 S Sgt Ross WC	1960
SC 49427 S Sgt Crane JA	1960
SF 39259 S Sgt Murphy JD	1960
SA 29102 S Sgt Ion RJ	1960
SF 13639 S Sgt Williams DB	1960
SA 61603 S Sgt Munday KR	1960
SC 6613 S Sgt Walker LH	1960
SB 49790 S Sgt Nicol RJ	1962
SB 94419 S Sgt Abell GW	1962
SB 12978 S Sgt Bennett BW	1962

Other RCEME personnel may have attended courses which should have been considered as qualifying courses; however, these are not reflected in DEME records. Anyone who has attended such a course and whose name does not appear above should advise DEME through the normal channels so that records may be corrected and his name published.

Since this article was written it has been agreed that the time element of three years can be waived in RCEME. Time does not permit the searching of records to determine those who qualified prior to 1960. An amended list will be published in the next issue of the Technical Bulletin.

PART 2 QUALIFICATION EXAMINATIONS

Lieutenant to Captain

The CGS has approved the granting of Part 2B Lt to Capt (RCEME) qualification on successful completion of the Subalterns EME Course at RCEME School. Since all prospective candidates for Part 2 Lt to Capt examinations this year have completed the Subalterns EME Course, it is not planned to hold Part 2B (RCEME) examinations this fall.

Candidates for Part 2A examinations will be required to take the examination at the nearest convenient Corps School. Dates set for Part 2 examinations by Corps are:

RCAC School, Camp Borden	-	23 - 25 Oct 63
RCSA, Camp Shilo	-	23 - 25 Oct 63
RCSME, Chilliwack, B.C.	-	6 - 8 Nov 63
RCS of I, Camp Borden	-	23 - 25 Oct 63
RCASC School, Camp Borden	-	23 - 25 Oct 63
RCOC School, Longue Pointe	-	25 - 27 Sep 63
RCS of S Barriefield, Ont	-	12 Sep 63 (Part 2A)
RCEME School Barriefield, Ont	-	12 Sep 63 (Part 2A)

Officers who are, or will be, eligible to take Part 2A examinations this fall will be notified dates and locations as soon as their eligibility is confirmed.

Captain to Major

Part 2A and Part 2B examinations will be held at RCEME School during the period 17 Sep - 19 Sep 63. Eligible candidates will be notified as soon as their eligibility is confirmed.

It may be of interest to note that the Part 2 examinations are set to cover as broad a scope as possible and that the level of the examinations is such that a candidate who has the knowledge and ability to make an average officer at the next higher rank will pass.

Habits because they are a barrier to change and progress, require serious attention. Dr Harry Neyers, late Personnel Director of Frigidaire, was once asked about 'teaching old dogs new tricks.' He replied "That depends on what you call old. Age is only a point of view. I know some old people who are young – and I know some young people who are old. For if you know all about something, you are old. And if you believe you are doing something as well as it can be done, you are old, yes, old enough to die. In fact, you are dead, and just waiting for your competitors to hold your funeral.

"But if you are glad to admit that you know but little about anything, you are young. And if you are sure that everything can be done much better than it is now being done – or ever will be done – then you are young and growing. Prosperous years are ahead of you and all you control."

-Office Executive, January 1954

According to a news release from HQ U.S. Army Signal Center and School, Fort Monmouth, New Jersey, a course in radar repair was established there in March.

The Ground Surveillance and Tracking and Plotting Radar Equipment Repair Course offers just what its long title suggests. The 29 weeks of instruction are devoted primarily to teaching the repair of four different radar sets. Three of these sets detect moving vehicles or personnel and report their findings through sound and visual electronic representation. The fourth is used to track drone aircraft during photo reconnaissance missions.

Among the ten students enrolled in the first section are Canadian Staff Sergeants F. W. Hill and G. McIntyre.

With the exception of the Canadian students, who have a radar background, members of the class first completed 17 weeks of basic radar electronics instruction before beginning a twelve-week block of instruction on the specialized radar equipment.

Much of the radar equipment for the course arrived only recently and is now being installed. Students first spend two weeks with a set nicknamed the Silent Sentry which returns an audio signal when it detects moving vehicles or personnel. Two such sets will be assigned at the company level in the new ROAD division.

A second two-week block of instruction prepares the students to repair a set nicknamed the Tipsy-33 which provides both an audio and a visual signal as it tracks moving objects. This equipment was designed for use at the battalion level.

The more complicated Tipsy-25 radar equipment requires three weeks of instruction. Utilized by division artillery, the Tipsy-25 not only senses movement but records target locations on a plotting board within seconds.

The repairmen finish their relatively long course with five weeks of instruction on a drone tracker, an automatic set designed for use by division aviation companies. The drone tracker produces visual signals and a continuous plot of the drone's locations while the photo reconnaissance mission is being carried out.

While students in the course receive a brief familiarization on the operation of the equipment, they are primarily concerned with its repair.

Instructor Sfc L. P. Custis explains the operation of the Silent Sentry radar set for S sgts Hill and McIntyre. The students are listening for an audio signal produced by the radar set when it detects moving personnel or vehicles. (Official U. S. Army Photo)

Canadian students receive diplomas from Southeastern Signal School, Ft Gordon, Ga. l to r: SSgt C. Gunness, Col A.L. Smith, and Sgt W.E. Skitteral.

Graduates of Single Rotor Utility Light Transport Helicopter Maintenance Course, USA Aviation School, Fort Rucker, Alabama. l to r: Cpl J.V. Leblanc, Cfn K.V. Pugh, Cpl H.E. Knight, Cfn H. Sutton, R.W. Enrich, R.E. Yolland, G.L. Glidden, G.W. Harrison, Cpl D.B. Johnson, Cfn J.B.C. Attenborough, J.D. Wood, and J.R. Gauthier, Col W.R. Williams, Jr., Assistant Commandant, awarded diplomas. Maj J.A. Beament, Canadian Liaison Officer, attended graduation. USA Army Photos

Technical Notes

ELECTRICAL

Radar Set AN/PPS-4
5840-00-682-2591

A quick glance at EME Manual Elec O 719 Instruction No 1 dated 22 Mar 63 could save you some grief. This instruction describes precautions to be followed in connecting the Radar to 24 volt power sources other than the nickel-cadmium battery BB-422/U.

The prime requirement is to make certain that the positive side of the source connects to ground, that is, to the frame of the equipment. If this is not done, the excessive current drawn by one or other of the power unit transistors, at the moment of switching on, will cause their demise. Neither the heating effect of this surge, nor that of the current which flows after transistor failure, is sufficient to blow the fuse.

The design solution is not to put in a smaller fuse since this has already been selected to meet the requirements of operation with correct polarity. Instead, a modification now under investigation by the design authority, will probably borrow a trick used in the Distance Measuring Set AN/TRQ-501. In the latter equipment, a high current capacity diode is connected across the primary power leads on the equipment side of the main fuse. Polarity of connection is such as to 'short' a reversed battery, ensuring that the fuse does blow and that power unit transistors do not.

Incidentally, the design authority is also developing a scheme to charge the BB-422/U from existing generators. This should become available very soon. Look out for it.

IDENTIFICATION OF METAL CORROSION

EME Manual General T 110 issued in Feb this year, contained a color print "Stages of Corrosion". Only 100 copies were printed, because of its cost, and that is the reason for units receiving less than their usual quota. Although distribution was made only to RCEME units, they're all gone, so please do not ask for a second copy.

REFINISHING GALVANIZED PARTS

The necessity for proper treating of galvanized rocker panels before painting has caused the manufacturers to issue service bulletins on the subject.

Your attention is drawn to EME Manual General T 100 "Painting and Paint Refinishing" for the military method and materials; para 20 b applies specifically to galvanized parts.

VEHICLES

1963 Plymouth Staff Cars
Ignition Timing

The contents of Chrysler Service Bulletin No 1088, 24 May 63, on ignition timing should be brought to the attention of all servicing personnel. This bulletin has been issued to all workshops.

Equipment failure reports have already been received on vibration dampers which have shifted on the hubs. Any further unserviceable dampers found will be reported for record purposes.

MANAGEMENT

NATIONAL DEFENCE "PROVISION OF SERVICES" REGULATIONS

New regulations governing the services that can be provided by the DND have been approved by Order-in-Council PC 1962-13/653. These regulations have removed many of the restrictions formerly in force.

AHQ letter HQ 4057-1 (DQOP) dated 11 Apr 63 details the policy and guidance respecting the provision of all services authorized by the new regulations.

The manpower and facilities of the DND have been provided for defence purposes and are not to be deverted to other tasks unless it is clearly necessary and demonstrably in the public interest to do so. Consequently (and as the regulations are permissive and do not establish any obligation upon the DND to perform services for others) the provision of such services is to continue to be restricted as much as possible and be confined to those cases where only the resources of the DND can properly satisfy what needs to be done.

The new regulations will necessitate the revision of several instructions. CAO 93-2 will be cancelled, and EME Manual Management H 042 will be rewritten. CAOs 93-10 and 93-11 will not require amending.

When no commercial rate is available for costing these services the labour charges in RCEME workshops, for other than civil emergencies or for other Federal Government departments will be in accordance with laid down rates plus ten per cent. The rates to be charged for recovery work is under study and will be notified when available.

MANAGEMENT QUIZ

By Lt HA Patterson

1. The maximum amount for labour and materials that a Command EME or the Commander of a RCEME Coy can authorize to satisfy an RCOC need is $150.

2. A Command EME or the Commander of a RCEME Coy can authorize the fabrication of Maintenance Technique items.

3. Cpl Salisbury, RCMP, submitted a CAFC 2149 on the local RCEME workshop requesting the repair of an RCMP vehicle. Is this service provided on a non-recoverable basis?

4. The Camp Engineer submits a CAFC 2149 to the supporting RCEME workshop for the repair of an "engineer store". The workshop finds that the repair is beyond its capabilities. Can the workshop backload this equipment?

5. The Officer Commanding a RCEME workshop suspects that the noise level in the body repair section at times reaches levels injurious to the tradesmen employed in this section. He requests the Regional Medical Officer to carry out a noise level survey. The survey reveals that an overall noise level of 90 decibels exists. If the tradesmen are required to work more than four hours in this noise environment, what type of ear protection, if any, is required?

6. Whose responsibility is it to implement an educational program to indoctrinate personnel on the potential dangers of hazardous noise?

(Answers on page 49)

BENCH-FITTING PROJECT

THE CRAFTSMAN'S RING
(Overlapping Laurel Leaves as in RCEME Badge)

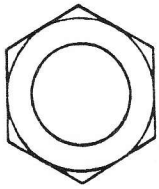
Worn on the small finger of the left hand.

May only be worn by its maker as a symbol of his craftsmanship.

The material of the ring is a common steel hexagon nut, thereby recognizing one of the most important devices of technical progress.

MANUFACTURING STEPS

1

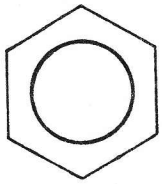


Use a regular steel hexagon nut of a size that will drill just under finger size (5/8-inch to ¾-inch).

2

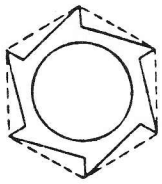
After drilling, cut a ring blank from the nut that will file square to a width of 7/32-inch.

3



Fit the ring blank to finger size by using a file, emery and crocus cloth so that the finished inner surface of ring is unmarred.

4

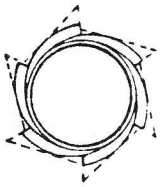


Alter the flats of the ring blank all around by filing them down as shown.

5

Alter each flat by filing it to a point keeping the sides of the points slightly curved to agree with the laurel-leaf contour.

6



Round each leaf into the next by filing so that a continuous outer side circle is formed.

7

With a knife file, sink the vein detail into each leaf. Finish the side and leaf surfaces so that the detail is clear and unmarred.

NOTE

The first 6 steps of manufacturing this ring will take about 2-1/2 hours.

Figure 4-1

UNOFFICIAL UNIT SIGNS

2 CANADIAN TANK TROOPS WORKSHOP

After a series of amusing incidents near Parkhatch, Surrey, early in 1944 and which were considered not nearly so amusing at the time, 2 Canadian Tank Troops Workshop became known as the "Howling Wolves." From a package of Coyote Pancake flour, Major GA Wiggan took the picture of a howling wolf squatting on a hill top silhouetted by a yellow moon, and used it as a unit flash.

Major Wiggan has recorded "just after the fall of Caen, Staff Sergeant "Smokey Joe" McKinnon came across General Montgomery with his car bogged down in the rubble with several British military policemen trying in vain to push it out. Staff McKinnon took over and towed the General's car out with his half-track. In thanking him, General Montgomery casually asked him 'Anything I can do for you, Staff?' Remembering that an order had come down forbidding unauthorized names and flashes on unit vehicles, McKinnon replied, 'Yes, Sir! let us keep our Wolf emblem!' About three days later Colonel H. D. Maitland, DDME 1 British Corps, stopped by and told us that General Montgomery had instructed him that some wild Canadian RCEME outfit was to keep a wolf badge on their vehicles. We never took them off thereafter."

-Wiggan to Hodgson 16 Mar 63

Because modern equipments are more complex than their less sophisticated counterparts of a decade ago, maintenance is a major problem. Whereas avionics complexity has increased twenty times in the last decade, the avionics maintenance shop still has the same complement on board – possibly even less. Thus evaluation of basic design maintainability improvement is highly significant in program selection.

-Navy Management Review

1 CANADIAN INFANTRY TROOPS WORKSHOP

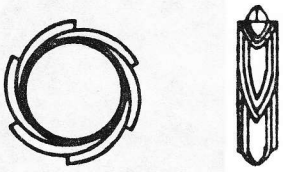
Sadie, the name given to a life-sized statue of an Italian maiden, was liberated from her garden near Lanciano in December 1943 and became the mascot of 1 Canadian Infantry Troops Workshop. She was outfitted with a tin hat, armed with a musket and bayonet and placed on guard duty outside the Workshop's Receipt and Issue tent.

Sadie continued her guard duty with the unit for the remainder of the war. She became well known throughout First Canadian Corps, becoming the accepted identification for the unit.

Sadie left 1 Canadian Infantry Troops Workshop in Arnhem on 4th of September 1945 for her new home in Barriefield, Ont, where she may be seen today guarding the main door of the White House at the School.

THE CRAFTSMAN'S RING

The Craftsman's Ring, ('Craftsman' being used in the sense of a skilled RCEME tradesman rather than of a rank) was introduced in April 1949. It was a symbol of craftsmanship worn on the little finger of the maker's left hand.



The ring was made from a common steel hexagonal nut shaped into a narrow band of six stylized laurel leaves.

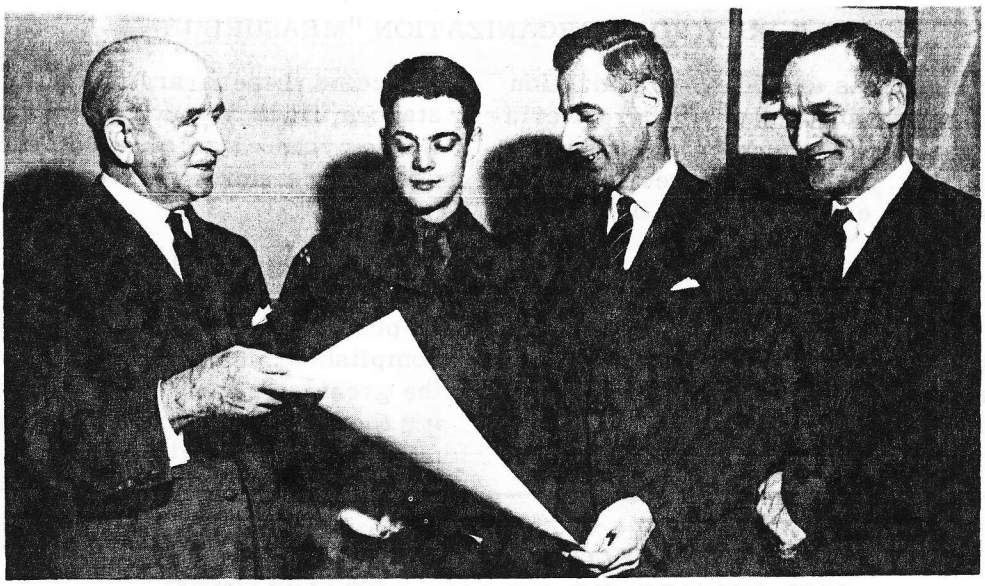
-RCEME Quarterly Apr 49.

RCE MEMORIAL SCHOLARSHIP FUND

As published in our January 1963 Technical Bulletin, four RCEME junior officers and officer cadets were awarded scholarships from this RCE Fund in 1962. Here now are photographs of three of the presentations. We have been unable to obtain a photo of O/Cdt VB Suddaby, University of Saskatchewan.

O/Cdt J Sanders, University of British Columbia, receiving his award from Lt Col JH Reeves, RCE, BC Area Engineer

LT DA GRANTHAM AT NOVA SCOTIA TECH (1 to r) Lt Col JPJ Vaughan, Chairman Halifax Branch, Military Engineers Association of Canada, Lt Grantham, O/Cdt RV Murray, RCE, and Lt Col LEC Schmidlin, Command Engineer.



2/LT JRG CHENIER AT THE UNIVERSITY OF OTTAWA
(l to r) Brig JL Melville, Col Comdt RCE, 2/Lt Chenier, Col A Mendelsohn, DEME, Col RJ Carson, Chief Engineer.

IT'S O.K. GEORGE, THE RCEME SCHOOL MUST BE RUNNING ANOTHER ESKIMO COURSE!

HOW DOES YOUR ORGANIZATION "MEASURE UP"?

How many pluses would your organization score in an evaluation based on the criteria shown in the chart below? If you have not taken a critical look at your activity recently, the results of such an evaluation may be quite a revelation.

A study group within the Navy compiled the criteria for use in testing the capabilities of the management processes and the structure of an organization and in identifying deficiencies and problems. The significance of each criteria may vary under different circumstances and there are probably no circumstances in which all criteria actually exist. Nevertheless, all are desirable and some should exist under all circumstances.

These criteria represent the desirable characteristics of an organizational structure or process (steps by which an objective is accomplished) which would, in combination, give the greatest probability of success in achieving the objectives in the most responsive, effective and economical manner.

GENERAL CRITERIA FOR EVALUATING THE PROCESSES AND STRUCTURE OF ANY ORGANIZATION

PROCESS	STRUCTURE	COMPATIBILITY
• EFFECTIVENESS Objective is clear. Steps are well ordered and will accomplish objectives. Produces balanced results. Cause and effect relationships are clear. Reporting needs are clear. Flexible - can revise individual steps without revising all.	**• EFFECTIVENESS** Responsibility is clearly assigned. Authority is commensurate with responsibility. Responsibility and authority are not duplicated. Lines of authority are clear. Minimum sharing of responsibility. Assignments of responsibility are stable. Power of decision at lowest practicable level. Rapid communication is possible.	Responsibility for each step of process is clear. Single executive responsible for each step of the process. Single executive responsible for all steps of the process. Informal organization operates to supplement - not supplant - the formal processes. Guided by a suitable common doctrine. Process is synchronized with other processes. Unsought (adverse) consequences are minimized.
• RESPONSIVENESS Follows policy of higher authority. Compatible with program element. Objectives reached on time. Allows timely reporting. Permits effective control. Uniformity in centralized direction. Rapid decisions are possible.	**• RESPONSIVENESS** Common subordinates derive their responsibility and authority from a single superior. Proper environment and attitude. Personnel are highly motivated to succeed. Centralized direction with maximum delegation. Rapid decisions are possible. Flexible - can accommodate changes in processes, programs, and objectives.	
• ECONOMY Steps are not duplicated. Minimum number of steps. Reporting is limited to actual needs. Need for control justifies the cost. Minimum expenditures of resources.	**• ECONOMY** Minimum layers of executives. Minimum personnel.	

-NAVY Management Review

TECHNIC TEASERS

Compiled by Capt PB Nicholson

We'll start off this series of teasers with two problems submitted by Mr Ernie Chartrand from DEME drafting office.

1 For some reason (and the reason doesn't matter) you find yourself in the position of requiring exactly five gallons of water. To measure this you have a three gallon container and a seven gallon container. How do you get the five gallons?

This one may come in handy some night in the mess if the lights go out.

2 In a darkened room there are five hats, three red and two black. Three men go into the room and put on one hat each. They come out of the room in single file and, without looking at the man behind them, are asked what colour hat they are wearing. The last man in the file replies he does not know. The middle man also replies he does not know. The first man correctly states the colour of his hat. What colour is this hat and how did he know?

Fishing season is upon us once more and the following fish story seems appropriate.

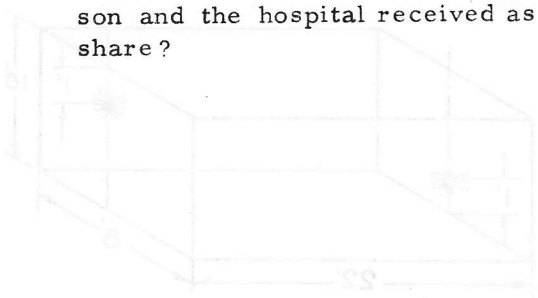
3 A man caught a shark and when boasting about it, he would only say that the head was 14 ft long, the tail was as long as the head and one-quarter of the back while the back was as long as the head and twice the tail. Find the length of the fish.

With summer and leave rapidly approaching one should sharpen up on trip planning. Try this one but watch your definition of average.

4 A car makes three trips all of equal length. The speed in miles per hour of the second trip was three times the speed of the first trip, and the speed of the third trip was double that of the second trip. If the average speed of all trips was 30 m. p. h., find the speed of each trip.

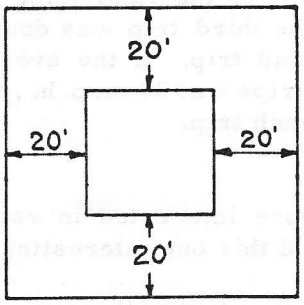
Anyone interested in estate planning. You will find this one interesting.

5 A man, who had three sons passed away. In his will he directed that his total cash should be divided among them except for a gift to the local hospital. He had a mathematical turn of mind, and after the will was made, he had worked the matter out and found that if he made the hospital gift to his eldest son, he would then have as much as the other two sons. But if he had given it to the second son, he would then have twice as much as the other two, while if he had given it to the youngest son, he would have three times as much as the other two. Now, if the man left a total of $1800, can you calculate how much each son and the hospital received as their share?



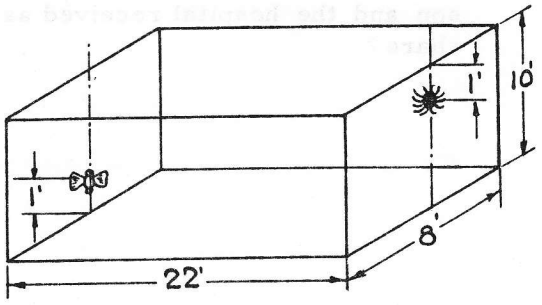
Anyone who was in Camp Gagetown last summer during the "raining season" will probably find the next problem easy.

6 Suppose you were outside the moat (see figure) and you desperately needed to get to the inside square. However, there were barracuda swimming in the moat. You had two 19 foot planks, but nothing whatsoever with which to fasten the two planks together. How could you get across the moat.



The cost problem is an old favourite and should be proof that not all is as it meets the eye.

7 A spider rests on one wall of a hallway with the dimensions shown below at a point one foot from the ceiling on the centre line of the shortest wall. On the opposite wall a fly is resting at a point one foot from the floor and also on the centre line of the wall. What is the shortest distance that the spider must travel to reach the fly. (The answer is NOT 32 feet).



We would still like to hear from you readers. Send in your favourite teaser and let others have a crack at solving it.

(Answers on page 40)

THE

One of the most baffling secrets of the human mind is the process that we call creativity. In recent years man has attempted to learn more about this fascinating subject, but we still do not understand very well how the creative mind works.

It is perhaps ironic that the same mind which can measure galaxies and probe the secrets of the atom still does not understand its own functioning. What goes on in the upper atmosphere is common knowledge. What goes on inside our heads is still a puzzle.

Over the centuries we have had plenty of opportunity to observe the results of the creative process – in art, science, literature, architecture, mathematics and many other fields. But we do not understand it. Even creative men and women themselves do not understand it. When they try to explain the creative process they often succeed only in mystifying us further.

In the modern world, where innovation is counted a priceless gift, man's curiosity about the creative process has been

PUZZLE OF CREATIVITY

By JOHN W. GARDNER President, Carnegie Foundation

This article is reprinted from Monsanto Magazine. The writer, John W. Gardner, also is the author of one of the most talked about books of recent years. Excellence (Harper & Row, 1961; Harper Colophon edition, 1962). In this controversial volume Gardner discusses the problems of excellence in a society concerned with equality.

greatly intensified. Some of the most interesting current research on creativity owes much to the initiative of Charles A. Thomas, chairman of the board of Monsanto. Mr. Thomas has been for some years a trustee of Carnegie Corporation, one of the oldest of the great philanthropic foundations. In 1955, Mr. Thomas proposed to the trustees that one of the subjects worthy of attention in the years ahead was creativity. He knew that it might take many years to probe this fascinating secret of the mind. But he proposed a beginning.

As a result of his initiative, the Carnegie Corporation has supported a variety of research activities aimed at this problem.

The most extensive of the research programs supported by Carnegie has been that conducted at the University of California. The University's Institute of Personality Assessment and Research, under the leadership of Donald W. MacKinnon, has studied hundreds of creative individuals in a variety of fields. It has given particular attention to three groups -- creative writers, research scientists and mathematicians, and architects. The groups were deliberately chosen from three quite different fields because it seemed probable that there is more than one kind of creativity.

Mr. MacKinnon and his associates believe that writers possess a type of creativity in which the product is largely an expression of the individual's inner state. He is spinning his play or novel or poem out of his imagination, restricted to only a limited degree by the requirements of "reality."

A second type of creativity is exemplified by mathematicians and scientists. Although they may be just as highly creative, their kind of creativity is not simply a pouring out of what is in them but an attempt to develop hypotheses, or achieve recombinations, within "the rules of the game" -- the rules being supplied by the facts of nature, the requirements of logic, or the limitations of technology.

Architecture might be thought of as a form of creativity which cuts across these two types.

The Institute began by drawing up lists of men who had been nominated as particularly creative by eminent individuals in their own fields. It then sought the cooperation of these individuals. Though some skeptics had predicted that creative people would be unwilling to cooperate, this did not prove to be so. They were curious to learn more about the creative process and quite willing to subject themselves to extensive tests and interviews. And, thanks to these studies, we know a great deal

about what creative people are like.

One of their most striking characteristics is independence. They just don't seem to get themselves imprisoned by group pressures. They don't spend much time asking, "What will people say?" The fact that everyone else believes something doesn't mean that the creative person will believe it. "Everybody's doing it" doesn't mean that he's doing it.

And yet, he is by no means that wild and unpredictable nonconformist that some romantics have pictured. On the contrary, he is likely to be quite conventional in manners, speech, clothing and other every-day details of life. Presumably he just doesn't see the point of expending a lot of energy to rebel in such matters.

It is in the area of his creative work that he wears no man's collar.

A second characteristic of the creative individual is flexibility. He doesn't have a lot of rigid views. He doesn't dig himself into a rut. He has a "playful" approach to the area of his creativity. He plays with ideas, "tries them on for size," walks around and looks at them from different angles, tests them in various combinations. It is at this point that he seems least scientific -- his approach seems disorderly rather than systematic, confused rather than organized, aimless rather than focused. But out of the disorder comes something that no computer could have hit upon.

In addition to independence and flexibility, the creative person has a certain openness. In the area of his interest he seems literally to see more, hear more, register more impressions, drink in more experience. Most of us are pretty skillful in shutting out the world. And what we do observe, we see with a somewhat jaded eye. But the creative person manages to keep a freshness of perception, an unspoiled and eager alertness.

More important, the creative individual has open channels of communication with himself. Most of us are accomplished fugitives from ourselves. We don't follow the ancient precept, "Know thyself," because it's the last thing in the world we want. Josh Billings said, "It's not only the most difficult thing to know one's self, but the most inconvenient thing."

But the creative person is on good terms with his own inner life. He is not unwilling to acknowledge all that he finds there in the way of fears and fantasies, hopes and frustrations, joy and bitterness. As a result, he is able to draw from that well, when necessary, the hunches and insights that contribute so much to the creative process.

One could go on at great length describing creative individuals. But perhaps we had better go on to one or two final questions.

First, how can we identify creative individuals? Of course it is no problem to identify them after they have exhibited their creativity. We want to identify them early so that we can give them every possible help. We don't really know the answer, but we have taken some important steps toward finding it.

For example, current research has demonstrated that the standard intelligence tests do not measure creativity. Although intelligence is an important attribute of the creative person, it seems clear that the creative youngster has something that is not measured by the tests.

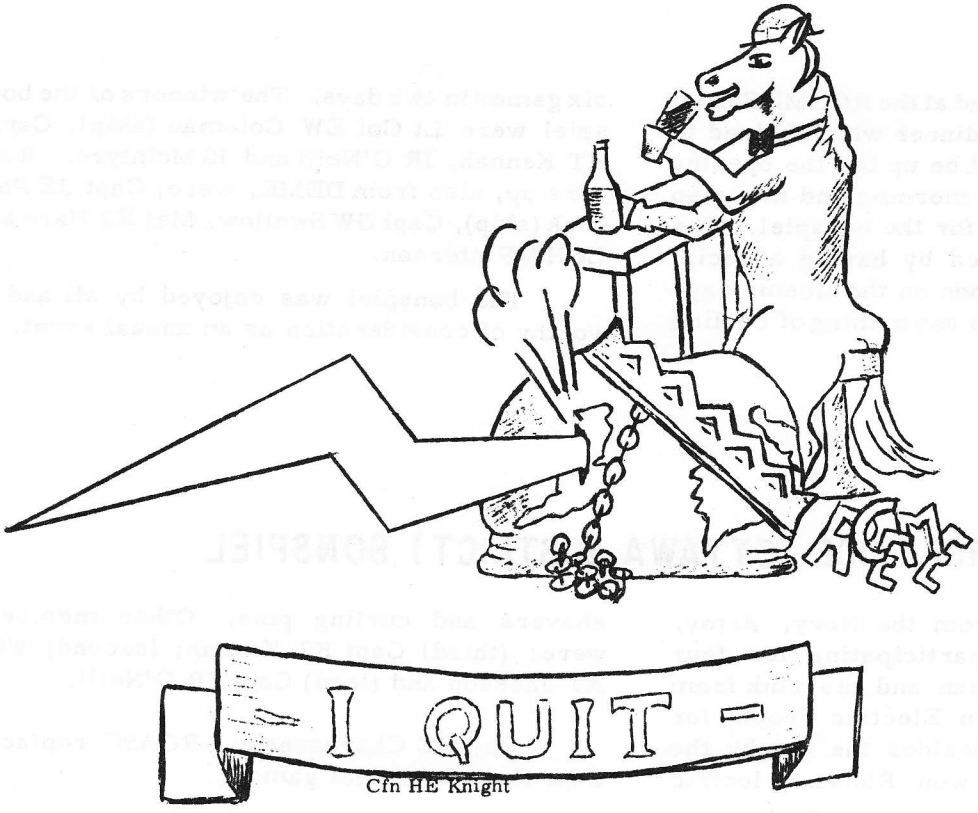
Another important finding is that teachers may not always be particularly enthusiastic about teaching creative children. In a study by Getzels and Jackson at the University of Chicago, teachers showed a marked prefer-

ence for teaching high IQ children as against average children. But they did not show the same preference for children high in creativity. Knowing what we do about the independent and often unorthodox approach of the creative mind, this is not difficult to understand.

Within the next few years we may learn a great deal about identifying creative children. In the meantime we must not make the mistake of supposing that the only important intellectual qualities are those measured by current intelligence tests. We must ask teachers to keep a sharp eye out for the signs of creativity, and we must hope that they will tolerate it when they encounter it, even though it may cause a certain amount of trouble.

The other concluding question is this: Is there any way to foster creativity?

If one phrases the question slightly differently -- "Can we teach people to be creative?" -- the answer is no, at least in the present state of our knowledge. But in the broader sense of the question as originally stated, the answer is almost certainly yes. At least we can make sure not to smother creativity. We can provide the kind of conditions in schools and in our communities which make it possible for the creative person to breathe. Creative individuals thrive on freedom and the opportunity to do the work they must do. Indeed, they want very little else. There is no reason why our schools and colleges and laboratories cannot be designed to provide working and breathing space for these somewhat unorthodox but exceedingly valuable men and women.



Cfn HE Knight

This is the last of our series depicting the adventures of the 'un-forcene' horse. His world now deflated by lightning, and RCEME slightly mixed up, he has doffed his coronet of four fleur-de-lys, thrown off his chain, and is quietly quaffing a cold ale.

Our thanks go to Cfn HE Knight, now of 10 Coy, for his most interesting drawings.

CURLING

A group of interested RCEME officer curlers held a two day bonspiel at the RCEME School on 8 - 9 Mar. Rinks participating were:

	Skip	Third	Second	Lead
Montreal:	Maj EW Cole	Lt RL Walker	Lt Col HM Robinson	Capt CR Morgan
	Capt FJ Burton	Col CW Jones	A. N. Other	Maj RC Rivers
	Lt LM Harvey	Lt JT Thompson	Maj JH Bourne	Lt JH Hayward
	Maj J Adams	Capt WC Perry	Maj SG Tait	Maj HA Popkin
Ottawa:	Lt Col EW Coleman	Capt KT Kennah	Capt JR O'Neill	Capt JS McIntyre
	Capt JE Peacock	Capt GW Swallow	Maj EJ Hare	Lt HA Patterson
Kingston:	Maj RN Shaw	Lt HJ Hellard	Capt DA Saunders	Lt GW Anscomb

Most curlers arrived at the RCEME School in time to join a mess dinner which helped to ensure all curlers would be up for the opening of the bonspiel the next morning and this also set the mood and spirit for the bonspiel. The Sergeants' Mess assisted by having a social hour for the curlers at noon on the closing day. The pace was terrific, to say nothing of curling six games in two days. The winners of the bonspiel were Lt Col EW Coleman (skip), Capts KT Kennah, JR O'Neill and JS McIntyre. Runners up, also from DEME, were; Capt JE Peacock (skip), Capt GW Swallow, Maj EJ Hare and Lt HA Patterson.

The bonspiel was enjoyed by all and is worthy of consideration as an annual event.

INTERSERVICE (OTTAWA DISTRICT) BONSPIEL

With 128 rinks from the Navy, Army, Air Force and RCMP participating for four trophies, Lt Col Coleman and his rink from DEME won the Northern Electric Trophy for Army Headquarters. Besides the trophy the DEME curlers each won Ronson electric shavers and curling pins. Other members were: (third) Capt KT Kennah; (second) WO1 AF Jackson and (lead) Capt JR O'Neill.

Maj ME Charbonneau, RCASC replaced Capt Kennah in final games.

DRAW INTO THE HOUSE

By Capt RDL Connell, CD

The Manarea RCEME Curling Bonspiel this year was held at the Canadian Joint Air Training Centre, Rivers, Manitoba. Rinks from Regina, Camp Shilo, Winnipeg and Rivers were welcomed by WO 2 "Squeak" Mahood late Friday, February 22, and early Saturday morning. The roll call at the time of the first draw saw sixteen rinks ready(?) for combat; two from 12 Coy RCEME, Regina, skipped by S sgt Weeks and Cpl "Shadow" Morrison; two from 212 Wksp, Camp Shilo, skipped by S sgt Arscott and Cpl Paton; one from 10 Coy RCEME, Winnipeg, skipped by Mr Langlois; one from 7 Tech Regt, Winnipeg, skipped by Maj Alexander; one from 2 SSM Trg Bty, Camp Shilo, skipped by S sgt Stooke; two from RCSA, Camp Shilo, skipped by Cfn Lee and Mr Willey; one from 2 RCHA LAD, Winnipeg, skipped by S sgt Bowles; two from 213 Wksp, Winnipeg, skipped by WO 1 Brown and Sgt Laird; and four from the Army Aircraft Maintenance Unit here at Rivers, skipped by WO 2 Rutherford, Cpl Turner, S sgt Thorne and S sgt Currie.

All rinks curled a heavy day on Saturday and relaxed at an appropriate curling party Saturday night which renewed old acquaintances and habits.

Sunday morning, among other things, brought the approach of the finals and Sunday afternoon saw Winnipeg take most of the honours. Final results were:

"A" Event	-	WO 1 Brown	Winner
		Cpl Turner	Runner-up
"B" Event	-	Mr Langlois	Winner - Miniature curling sheet
"C" Event	-	S sgt Bowles	Winner - Comfortable enamelled cup

Individual prizes were .22 -cal rifles, 2 gal thermoses, hand tooled wallets and sports shirts.

The Bonspiel was honoured by the presence of Col WS Hunt, now Camp Commandant, Camp Shilo, and formerly of RCEME, who presented prizes to the hard-working winners.

L to R: S sgt Bowles, Mr Langlois, Col Hunt, WO 1 Brown, Cpl Turner

ANSWERS TO TECHNIC TEASERS

Method 1

1. a. Fill 3 gal container and empty into 7 gal container.

   b. Refill 3 gal container and empty into 7 gal container.

   c. Refill 3 gal container and fill 7 gal container leaving 2 gals in 3 gal container.

   d. Empty 7 gal container and pour 2 gals from 3 gal container into it.

   e. Another 3 gals in the 7 gal container gives 5 gal.

Method 2

   a. Fill 7 gal container.

   b. Fill 3 gal container from 7 gal container twice, empty the 3 gal container each time.

   c. Pour remaining 1 gal from 7 gal container into 3 gal container.

   d. Refill 7 gal container and fill 3 gal container (requires 2 gals).

   e. You now have 5 gals in 7 gal container.

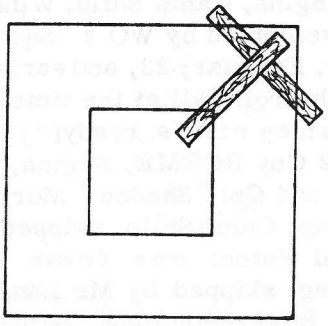
2. The hat is red. The rear man must see either two red hats or one red and one black hat to answer "I don't know." If the front man's hat were black the middle man would know that his own hat was red. Since he cannot answer, the front man's hat must be red.

3. 93 feet.

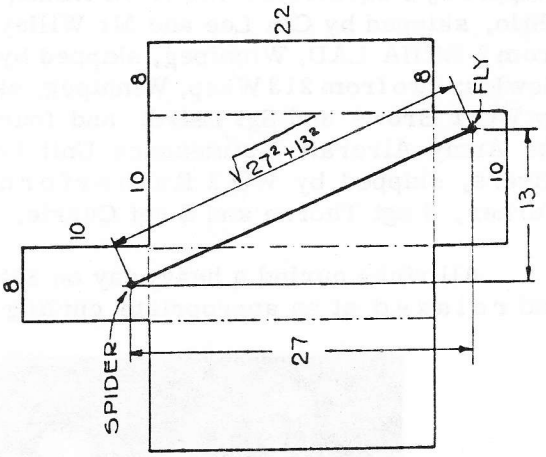
4. 1st trip = 15 mph
   2nd trip = 45 mph
   3rd trip = 90 mph

5.

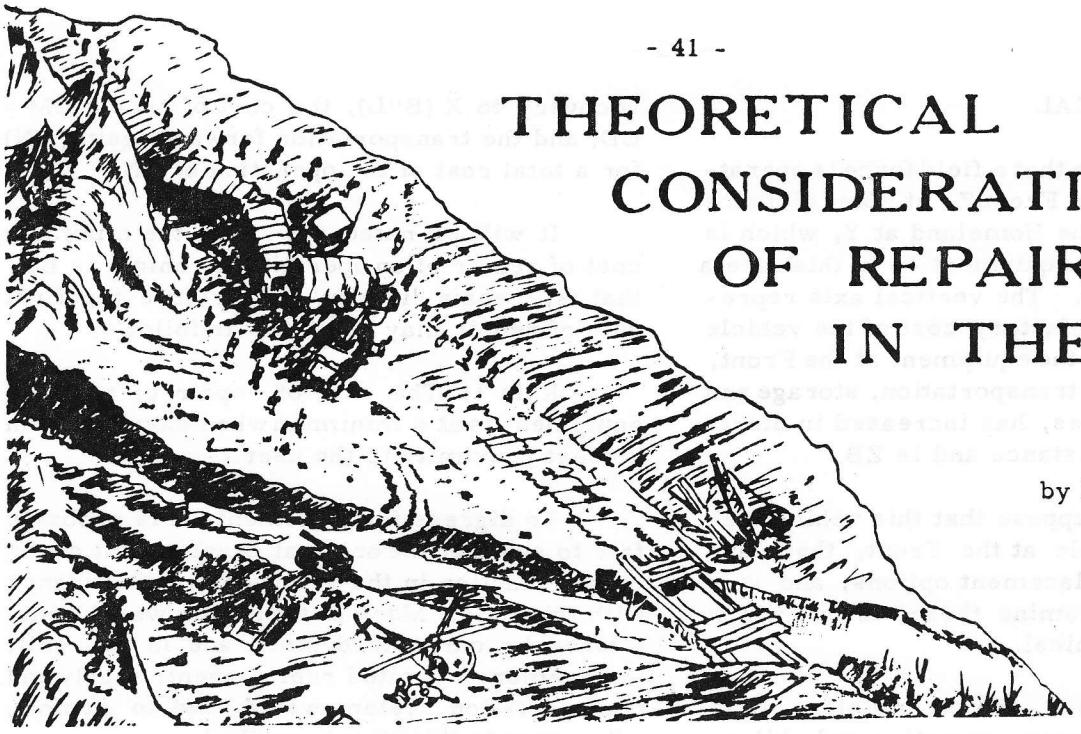
Eldest	-	$ 75.00
Second	-	$375.00
Third	-	$525.00
Hospital	-	$825.00
		$1800,00

6. 

7. Approx 30 feet.



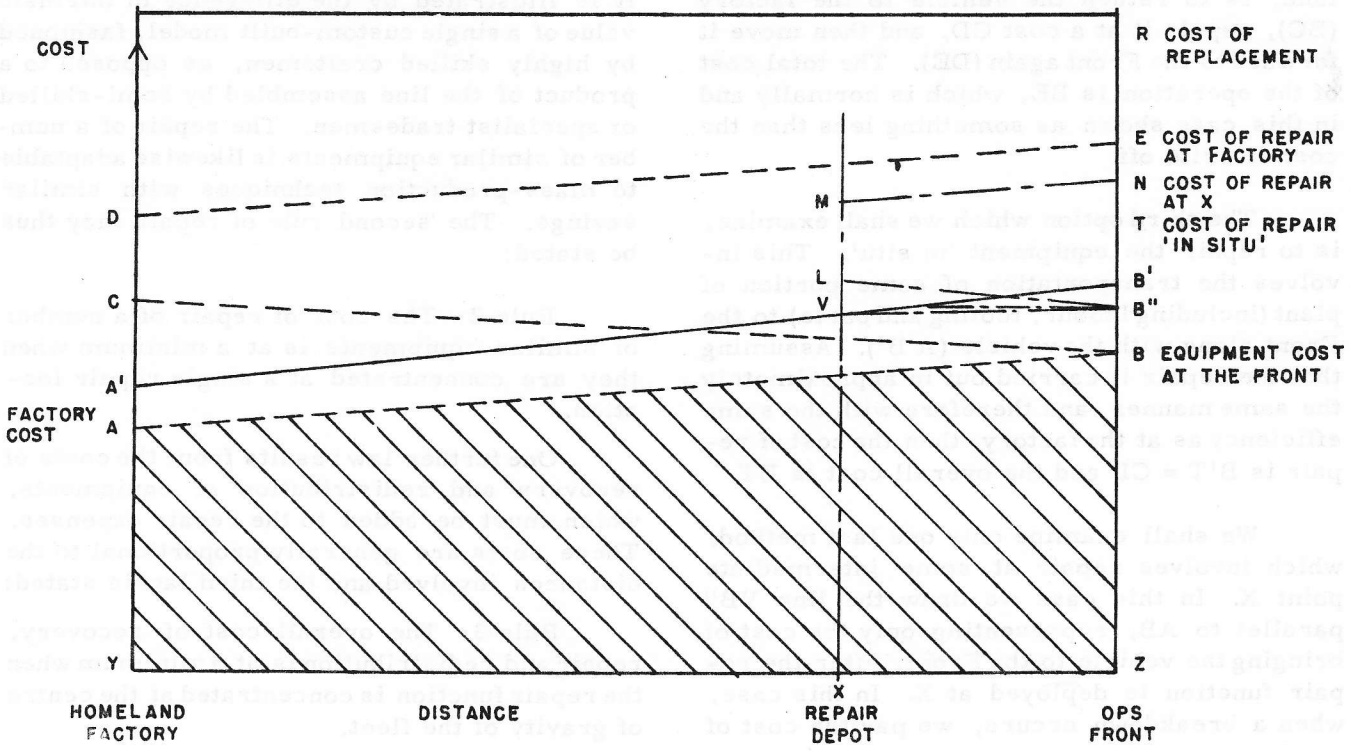
PRESS RELEASE
OTTAWA — THE CANADIAN ARMY NO LONGER FACES THE TERROR OF "NEEDLES". PAINLESS INNOCULATIONS ARE DONE BY AN AUTOMATIC "GUN".
RIM
REPAIR
W. E. McLaughlin
THE INSTRUCTIONS SAY THAT THE PRESSURE ADJUSTMENT IS A TRIFLE TRICKY···



THEORETICAL CONSIDERATIONS OF REPAIR IN THE FIELD

by Maj JF Clarabut

Most of the functions of an army in operations do not lend themselves readily to examination on an economic basis, for it is not possible to place a monetary value on the abstract, intangible and human factors involved. One possible exception to this general rule is the function of repair.



MAINLY HISTORICAL

Let us assume that a field force is operating at an Operational Front Z, at some distance from a factory in the Homeland at Y, which is supplying technical equipment -- in this case a vehicle (see below). The vertical axis represents cost, and the factory cost of the vehicle is YA. The cost of the equipment at the Front, after the addition of transportation, storage and maintenance charges, has increased in direct proportion to the distance and is ZB.

Now if we suppose that this vehicle becomes unserviceable at the Front, there are several repair/replacement options, and it is our intention to examine these, to find which one is most economical.

The first choice, and the simplest, is to write off the equipment, an action and philosophy which might be welcomed by the manufacturer, but is not likely to please the taxpayer. The cost of replacement is BR, which equals the original cost ZB.

The second choice, which is based upon leaving the entire repair function in the Homeland, is to return the vehicle to the factory (BC), repair it at a cost CD, and then move it forward to the Front again (DE). The total cost of the operation is BE, which is normally and in this case shown as something less than the cost of write off.

The third option which we shall examine, is to repair the equipment 'in situ'. This involves the transportation of some portion of plant (including labour, tooling and parts) to the Front along with the vehicle (A'B'). Assuming that the repair is carried out in approximately the same manner, and therefore with the same efficiency as at the factory, then the cost of repair is B'T = CD and the overall cost is BT.

We shall examine only one last method, which involves repair at some intermediate point X. In this case we draw the line VB'' parallel to AB, representing only the cost of bringing the vehicle to the Front, after the repair function is deployed at X. In this case, when a breakdown occurs, we pay the cost of recovery to X (B''L), the cost of repair LM = CD, and the transportation forward again (MN) for a total cost of the operation of BN.

It will be noted now, that the minimum cost of repair of an operational vehicle is BT, that is, repair 'in situ'. Therefore the first rule of repair may be stated as follows:

Rule 1: The cost of repair of a single equipment is at a minimum when carried out in closest proximity to the user.

*

To digress for a moment, it is probably fair to say that the original development of the repair function in the army was in accordance with this rule. Much of the repair was accomplished by corps tradesmen and in the unit; furthermore a limited replacement, supply and transportation system would tend to prolong adherence to this repair method.

It is now necessary to modify the first law of repair, primarily in the light of technical progress in the present century. The tremendous increase in manufacturing efficiency as a result of mass-production methods may be applied also to a large degree in repair. It is illustrated by the difference in intrinsic value of a single custom-built model, fashioned by highly skilled craftsmen, as opposed to a product of the line assembled by semi-skilled or specialist tradesmen. The repair of a number of similar equipments is likewise adaptable to mass-production techniques with similar savings. The second rule of repair may thus be stated:

Rule 2: The cost of repair of a number of similar equipments is at a minimum when they are concentrated at a single repair location.

One further law results from the costs of recovery and redistribution of equipments, which must be added to the repair expenses. These costs are generally proportional to the distances involved and the third law is stated:

Rule 3: The overall cost of recovery, repair and redistribution is at a minimum when the repair function is concentrated at the centre of gravity of the fleet.

* Only true because BT takes = CD (not strictly to be true).

(It may be legitimately argued that there is an upper limit to the number of equipments and the geographical area over which the fleet is deployed. But one should not be over-influenced by past and present procedures, particularly in our economy, where the individual has been willing to pay a very high price for the convenience of the local repair shop. It should be noted that the trend to specialized repair as practiced by the 'Speedy Muffler' or 'Speedy Brake' replacement shops, demonstrates that there is still a large potential saving. And thinking in terms of the size of an army area, an equipment could be moved a considerable distance to take advantage of the savings.)

To digress again, it was at least in part the application of the second and third rules of repair which resulted in the formation of the Corps of RCEME in the last war. However, in the ideal case presented it would appear that one echelon of repair and a single workshop represents a most adequate system. How then does one explain an organization of three echelons of repair (unit, field and base) located in four lines, and superimposed on a seven-echelon command structure, troop to army? One must of course consider the other factors involved. These include the extent of the repair, restricted movement, time, service to the user, adaptation to an existing logistic system, mobility of units, diversity of equipment and security in dispersion; in these circumstances a multi-echelon, multi-unit organization may be considered preferable even though it is not as efficient. We should bear in mind, however, that this echelon system together with the size and location of repair units and the Permissive Repair Schedule have all been arbitrarily set, or are dependent upon an arbitary decision. They are NOT therefore unchangeable.

In addition it should be noted that one or two elements have been added to the system to give flexibility and to take up the strain of abnormal operations. These are the Medium Workshop (third line repair) and indigenous labour at the Base Workshop level.

FUTURE TRENDS

All of this, being mainly historical, is not very profound; if nothing else, however, we may now distinguish the rules of efficient repair from some of the desirable features and time-honoured methods of the British logistic system. It has been said, on high authority, that there is little use superimposing new weapons and equipments on the Second World War organization and then to try to work out the tactical, logistical and organizational changes involved. The better approach is to go back to first principles.

It is proposed therefore (based upon these general ideas of the characteristics and requirements of repair system) to look at possible future trends. It will be appreciated that the nuclear concept and policies are changeable and so, in order to have a firm base on which to make an examination, the following conditions are postulated:

a. The strategic atomic deterrents are limited to two major powers for reason of cost, are neutralized, and will NOT be used.

b. Tactical nuclear weapons will continue to be refined by the present holders; in addition other nations with the resources will continue their development. However, on moral grounds and from fear of escalation, these weapons will NOT likely be employed.

c. Therefore, in the Canadian army, conventional armaments and organizations will be maintained and further developed; however they must be made adaptable to atomic operations.

In essence, then, the problem, which has been under examination for many years, is to build functional organizations which are compatible with both conventional and nuclear conditions. Our immediate problem is to study the effect of the nuclear threat upon the repair organization; this is twofold and may be considered to have indirect and direct consequences.

First we shall examine the indirect results. The threat of the use of tactical atomic weapons upon the battlefield demands dispersal of the fighting units for protection. However, to fight any action, offensive or defensive, they must also have the ability to quickly concentrate. Thus a concertina effect is introduced -

on contact there is concentration of forces to fight and on disengagement by either side there is dispersal to reduce possible atomic casualties in personnel and equipment. On this basis, authorities claim that increased tactical mobility is one of the most critical requirements of the land forces.

This increased requirement for mobility affects the repair organization in two ways:

a. It increases the requirement for repair resources to maintain transport (air, land and water) by reason of increased quantities and complexity of equipments.

b. It makes difficult the concentration of a fighting unit's transport for repair. It should be noted, however, that it does not adversely affect the concentration of other types of equipment which are normally smaller and lighter; if the problems of mobility are solved, then the concentration of these other equipments should in fact be greatly improved.

Since the concentration of a fighting unit's unserviceable transport is difficult, and tends to present an easily identified and vulnerable target, there is a tendency to revert to a less efficient repair system and to do more of the repair 'in situ'. With the numbers of transport equipments increasing in the forward unit, and the increasing difficulties in getting them back to a repair installation, there is a strong argument for shifting the degree of repair responsibility forward, that is, to give the unit or squadron the men, the tools and the spares to do the job. In point of fact then, the field repair of transport equipment tends to and should be shifted from the Field Workshop to the LAD or unit, who have communication with, and the same mobility as, the parent unit.

If we are successful in providing the arms and their integrated service support with increased mobility, we must give the backup supply and transport services similar capability in order that they may adequately fulfil their functions. If this is provided, it should be possible to move the balance of the field repair function far to the rear, thus helping to clear those waste spaces envisaged behind and between the forward troops and in which they will operate. The supply service with its increased efficiency will be able to provide the forward units with the spares to do field repairs on heavy equipments 'in situ' while transportation service will be able to concentrate the smaller and lighter repairable equipments at the corps level - possibly by air lift. This takes full advantage of the savings in multiple repair.

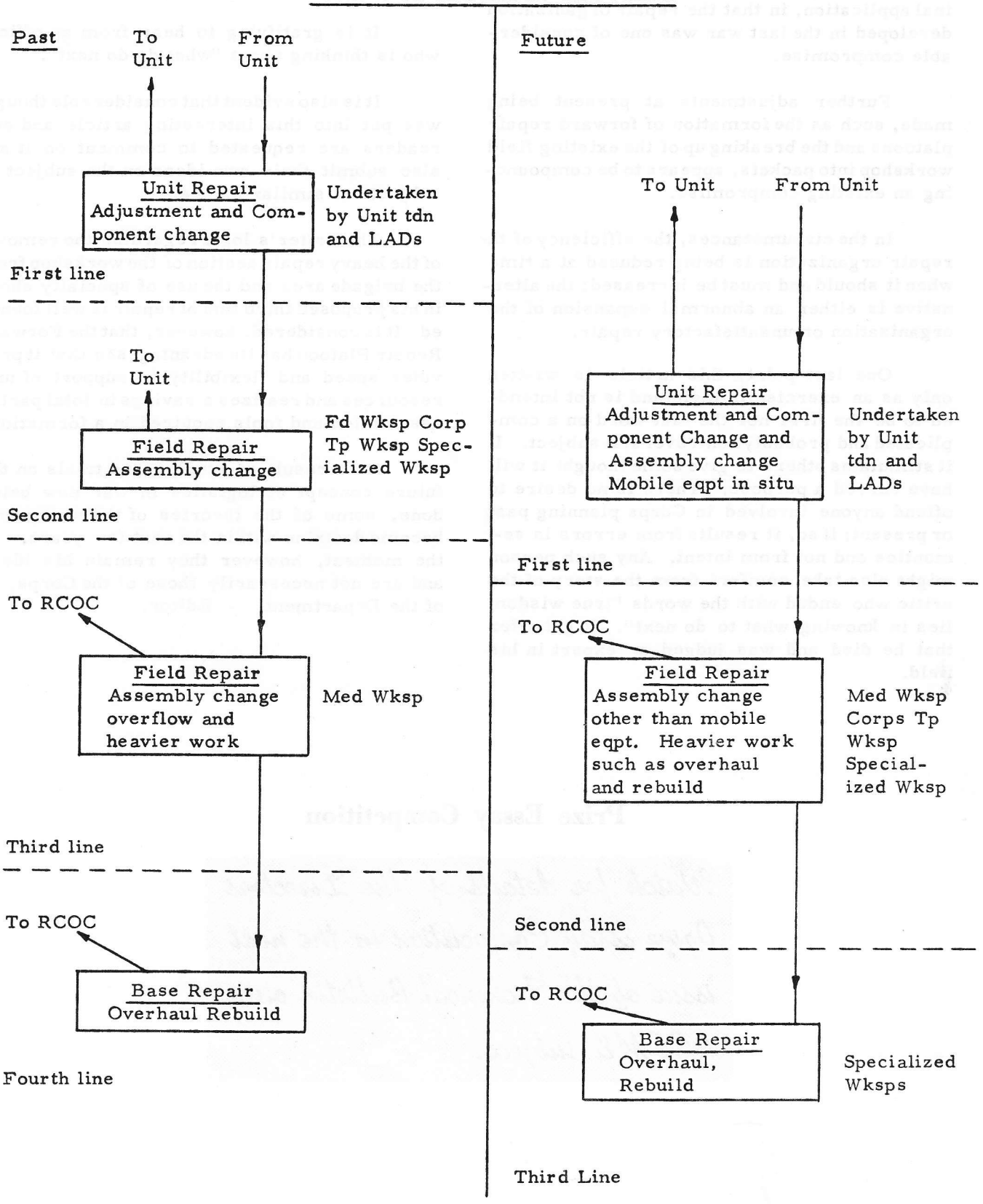
It was mentioned that there was also a direct effect of the atomic weapon upon the repair organization - forced dispersion. This would be particularly critical at the base workshop level as we have known it. But it also applies to the field and medium workshops which, if located forward where the probable error of the enemy delivery system is small, would present a worthwhile target. We have been able, however, by sending forward those portions of the field workshop which are responsible for transport repair, to considerably reduce its size. In addition by moving the balance of its repair responsibility to the rear, we have reduced the probability of its presenting a worthwhile target. One then sees this latter repair responsibility becoming a function of the medium workshop which would now do all field repair except that for mobile equipment of the forward units. And this echelon would be ideally located to help in refitting units withdrawn from the line and into reserve. (See Stages of Repair in the Field)

The major change foreseen at the advanced base and base workshop levels, in keeping with the rules of efficient production, will be to break them down into small shops for specialized repair. In this way we take full advantage of quantity repair techniques and still are able to reduce substantially, by dispersal, the size of installations. In point of fact, this echelon might well disappear also, being absorbed into the medium workshop organization, thus forming two basic echelons of repair.

CONCLUSION

The repair function is subject to fundamental rules which can only be ignored at the expense of efficiency.

STAGES OF REPAIR IN THE FIELD



These rules were adjusted in their original application, in that the repair organization developed in the last war was one of considerable compromise.

Further adjustments at present being made, such as the formation of forward repair platoons and the breaking up of the existing field workshop into packets, appears to be compounding an existing compromise.

In the circumstances, the efficiency of the repair organization is being reduced at a time when it should and must be increased; the alternative is either an abnormal expansion of the organization or unsatisfactory repair.

One last point; this article is written only as an exercise in logic and is not intended to be the first nor the last word on a complicated and probably controversial subject. If it stimulates others to give some thought it will have served a purpose. There is no desire to offend anyone involved in Corps planning past or present; if so, it results from errors in semantics and not from intent. Any such person might also take comfort from the story of the critic who ended with the words "true wisdom lies in knowing what to do next". Right after that he died and was judged an expert in his field.

POSTSCRIPT

It is gratifying to hear from an officer who is thinking about "what do do next".

It is also evident that considerable thought was put into this interesting article and our readers are requested to comment on it and also submit their own ideas on the subject or subjects of similar nature.

The writer's logic regarding the removal of the heavy repair section of the workshop from the brigade area and the use of specialty shops in his proposed third line of repair is well founded. It is considered, however, that the Forward Repair Platoon has its advantages in that it provides speed and flexibility in support of unit resources and realizes a savings in total parts, assemblies and tools required in a formation.

As a result of studies and trials on the future concept of logistics in war now being done, some of the theories of the writer may become doctrine within the next few years. At the moment, however they remain his ideas and are not necessarily those of the Corps, or of the Department. - Editor.

Prize Essay Competition

Watch for details of The Directors Prize Essay Competition in the next issue of the Technical Bulletin on a RCEME subject.

WHO'S WHERE

LOCATION OF RCEME WARRANT OFFICERS

Class 1

Baynes	CH	6 Coy RCEME
Boshier	R	204 Base Wksp RCEME
Brennan	RS	RCEME School
Brown	AT	10 Coy RCEME
Brunton	AC	8 CH LAD RCEME
Buck	WM	14 Coy RCEME
Clarke	DL	RCD LAD RCEME Camp Gatetown
Cozens	SD	RCEME School
Dagenais	EJ	9 TPT - RCASC
Dodds	TH	RCEME School
Doherty	E	10 Coy RCEME
Drew	CV	AEEE
Drobot	W	5 Coy RCEME
Dudley	J	D Org AHQ
Elliott	WEC	4 Coy RCEME
Fernets	JM	11 Coy RCEME
Fox	HR	AEEE Orleans Ont
Gallier	H	RCEME School
George	AG	202 Base Wksp RCEME
Gibbs	WR	2 Coy RCASC
Gladwin	CH	CADEE Valcartier Que
Guilfoyle	ME	RCEME School
Hanash	J	8 Coy RCEME
Hayes	JW	DEME
Henry	JE	11 Coy RCEME
Holtzhauer	WN	RCASC School
Houlton	VH	DEME
Hunder	BAJ	RCEME School
Hurd	LR	202 Base Wksp RCEME
Jackson	AF	DEME
Jackson	O	RCEME School
James	JW	RCAC School
Keech	HL	DEME
Knight	RA	16 Coy RCEME
Knowles	GA	RCAC School
Landry	JL	4 Coy RCASC
Langford	WH	2 Coy RCEME
Lee	KA	56 Inf Wksp
Leon	BU	12 Coy RCEME
Leonard	WV	14 Coy RCEME
Lewis	CB	202 Base Wksp RCEME
Lewis	SM	13 Coy RCEME
Longley	GM	12 Coy RCEME
Lowry	LH	DCER
MacDonald	DJ	DEME
Mallett	JC	AEEE
McInnes	DM	18 Coy RCEME
McMurchy	WS	DEME
Meloche	JB	HQ Quecom 'I' Staff
Mercer	JL	RCEME School
Munroe	GW	Br of QMG RCASC
Neil	T	2 Coy RCEME
Norbury	G	13 Coy RCEME

Class 1

Oakes	GAM	DEME
Owen	LR	7 Coy RCEME
Parker	JC	204 Base Wksp RCEME
Patterson	DJ	DEME
Richardson	W	202 Base Wksp RCEME
Rivers	AM	RCEME School
Robertson	WG	3 Coy RCEME (1 July)
Rowe	AW	RCEME School
Rutherford	FA	CJATC
Shaw	JE	Exp Bde Serv Bn Camp Gagetown
Sherman	CG	DEME
Sinclair	L	Cent Ont Area 'I' Staff (1 July)
Snell	JD	AEEE
St Pierre	G	LdSH(RC)
Stewart	RH	16 Coy RCEME
Stringer	AJ	1 Fd Wksp RCEME Calgary
Szumlanski	J	2 Fd Wksp RCEME Camp Petawawa
Tatham	J	11 Coy RCEME
Thivierge	AJ	AEEE Orleans Ont
Thomas	GA	RCSA
Walsh	IS	AEEE Orleans Ont
Warren	DH	202 Base Wksp RCEME
Weston	ET	4 Fd Wksp RCEME Europe
Wilkinson	EJ	202 Base Wksp RCEME
Wilson	RR	CBUE
Young	RD	16 Coy RCEME

Class 2

Adams	RMJ	RCEME School
Allen	EB	10 Coy RCEME
Allen	JJ	202 Base Wksp RCEME
Allen	WG	1 Fd Wksp RCEME Calgary
Almey	B	DEME
Anderson	JS	202 Base Wksp RCEME
Anderson	SB	18 Coy RCEME
Armstrong	JH	4 RCHA
Armstrong	RWF	3 Tpt RCASC
Axford	DS	DEME
Bailey	E	204 Base Wksp RCEME
Balmer	AJ	5 Coy RCEME
Barker	NG	RCSA
Barrett	HJ	202 Base Wksp RCEME
Barrey	WGA	202 Base Wksp RCEME
Bellefontaine	AEL	Exp Bde Serv Bn Camp Gagetown
Boisvert	L	5 Coy RCEME
Both	TA	6 Coy RCEME
Bottle	DA	1 Coy RCEME
Bouchard	JM	16 Coy RCEME
Bovey	ET	3 CIBG LAD RCEME Camp Gagetown
Brooks	LFJ	8 Coy RCEME
Broomer	TF	4 Coy RCEME
Brown	AW	3 Coy RCEME

Class 2

Burgess	EW	3 CIBG LAD RCEME Camp Gagetown
Burnett	JH	204 Base Wksp RCEME
Cameron	FR	2 Fd Wksp RCEME Camp Petawawa
Cameron	WE	10 Coy RCEME
Campbell	DN	RCEME School
Carefoot	WN	202 Base Wksp RCEME
Cassidy	GP	RCEME School
Carver	AE	RCEME School
Celli	AJ	202 Base Wksp RCEME
Christensen	AJ	204 Base Wksp RCEME
Clarke	AL	ME
Clarke	DC	10 Personnel Depot
Clyde	KT	204 Base Wksp RCEME
Cochrane	HM	DEME
Coles	JC	11 Coy RCEME
Colson	AR	3 Coy RCEME
Coughlan	GH	56 Inf Wksp
Coughlin	AF	2 Fd Wksp RCEME Camp Petawawa
Crane	CE	RCEME School
Cross	FT	204 Base Wksp RCEME
Crosson	JH	10 Coy RCEME
Cummings	D	202 Base Wksp RCEME
Cunningham	JM	4 Coy RCEME
Dainty	HW	2 Fd Wksp RCEME Camp Petawawa
D'Amour	LOJ	2 Coy RCASC
Dance	GN	RCEME School
Dand	RJM	13 Coy RCEME
Davis	WE	RCEME School
Deans	AG	HQ Wescom
Dewar	J	DEME
Dinner	A	2 Fd Wksp RCEME Camp Petawawa
Doherty	SF	202 Base Wksp RCEME
Dorey	EE	RCD LAD RCEME
Dormer	NH	202 Base Wksp RCEME
Drake	EA	6 Coy RCEME
Duncan	FP	1 CIBG LAD RCEME Calgary
Dyck	D	202 Base Wksp RCEME
East	SW	2 Coy RCEME
Elliott	BD	202 Base Wksp RCEME
Eno	JB	2 TPT Coy RCASC
Evans	RL	12 Coy RCEME
Fairbairn	TM	10 Coy RCEME
Fairfield	LR	4 TPT RCASC
Feller	DH	4 Coy RCEME
Ferguson	HG	3 Coy RCEME
Fielding	C	204 Base Wksp RCEME
Foley	HEF	3 RCHA LAD RCEME Europe
Fourcaudot	C	5 Coy RCEME
Fryer	JWA	7 Coy RCEME
Gall	GJ	CADEE Valcartier Que
Gavriloff	W	AEEE Orleans Ont
Germain	DP	13 Coy RCEME
Gibbs	BF	14 Coy RCEME
Gill	DE	AEEE Orleans Ont
Goss	RB	1 RCHA LAD RCEME Camp Gagetown
Graham	AA	13 Coy RCEME
Graham	JC	3 Coy RCEME
Grible	DL	3 Coy RCEME

Class 2

Griffin	GW	3 Coy RCEME
Halliday	AG	4 Fd Wksp RCEME Europe
Hardy	JR	4 Fd Wksp RCEME Europe
Harper	JM	RCEME School
Haugen	RG	Exp Bde Serv Bn Camp Gagetown
Hennssey	RF	1 Fd Wksp RCEME Calgary
Henry	CR	11 Coy RCEME
Heuisson	RW	4 CIBG LAD RCEME Europe
Hill	LJF	1 TPT RCASC
Hinton	WG	RCEME School
Holt	JS	2 CIBG LAD RCEME Camp Petawawa
Hooper	TC	4 Fd Wksp RCEME Europe
Janasen	MEJ	202 Base Wksp RCEME
Jodoin	LH	RCEME School
Johnson	GM	RCEME School
Johnson	GT	ATOB
Johnson	WA	7 Coy RCEME
Johnstone	T	204 Base Wksp RCEME
Jones	HR	FGH LAD RCEME Camp Petawawa
Joyner	EF	CADEE Valcartier Que
Keating	EA	Exp Bde Serv Bn Camp Gagetown
Kelly	MP	16 Coy RCEME
Keogan	MJ	4 Fd Wksp RCEME Europe
Kirkpatrick	AM	8 Coy RCEME
Konzuk	A	1 Fd Wksp RCEME Calgary
Kraemer	KE	RCEME School
Krupp	HH	4 Fd Wksp RCEME Europe
Laird	WW	14 Coy RCEME
Lasuta	W	12 Coy RCEME
Lauret	JE	1 Fd Wksp RCEME Calgary
Lawrence	BJ	11 Coy RCEME
Leon	GR	1 Fd Wksp RCEME Calgary
Lewis	LH	202 Base Wksp RCEME
Little	JE	202 Base Wksp RCEME
Low	GA	202 Base Wksp RCEME
MacDonald	CW	4 Fd Wksp RCEME Europe
MacLean	CB	CADEE Valcartier Que
MacLellan	EB	202 Base Wksp RCEME
MacLeod	D	DEME
MacPhee	DM	CBUE
Mahood	NEH	CJATC HL
Main	T	1 Fd Wksp RCEME Calgary
Mandy	RH	2 TPT Coy RCASC
Manning	RW	13 Coy RCEME
Marin	EW	2 CIBG LAD RCEME Camp Petawawa
Marston	CV	HQ RCEME Wescom Edmonton
Mason	J	14 Coy RCEME
Maw	A	7 Personnel Depot
Maxwell	AC	16 Coy RCEME
McBlane	AG	Alta Area 'I' Staff Edmonton
McCaffrey	LE	2 Fd Wksp RCEME Camp Petawawa
McCormack	CB	Exp Bde Serv Bn Camp Gagetown
McDonell	AF	1 Fd Wksp RCEME Calgary
McDow	KA	AEEE Orleans Ont
McElroy	JC	14 Coy RCEME
McGovern	PMJ	DDD AHQ
McIntyre	WA	7 Personnel Depot
McLeod	HAT	RCEME School

Class 2

McLeod	MH	DEME
Measor	HD	1 CIBG LAD RCEME Calgary
Melvin	GR	202 Base Wksp RCEME
Milne	HC	202 Base Wksp RCEME
Molnar	LA	DEME
Moore	WE	DEME
Munday	AC	12 Coy RCEME
Myatt	WC	Exp Bde Serv Bn Camp Gagetown
Newell	GS	202 Base Wksp RCEME
Nicolson	A	10 Coy RCEME
O'Grady	CL	202 Base Wksp RCEME
O'Rourke	NW	Cent Ont Area 'I' Staff
Pattendon	AC	Man Area 'I' Staff
Patterson	MP	204 Base Wksp RCEME
Pennie	FM	11 Coy RCEME
Perrier	LG	202 Base Wksp RCEME
Perrin	WG	202 Base Wksp RCEME
Phillips	EW	RCEME School
Pineo	MC	Exp Bde Serv Bn Camp Gagetown
Pirt	KMC	3 RCHA Incr 'A' Europe
Press	J	AEEE Orleans Ont
Price	EC	4 Fd Wksp RCEME Europe
Proud	VS	204 Base Wksp RCEME
Rawling	GW	D Pers RCEME AHQ
Reid	FL	202 Base Wksp RCEME
Reimer	JJ	13 Coy RCEME
Reynolds	GA	4 Coy RCEME
Rhodes	AP	204 Base Wksp RCEME
Richardson	PH	8 Coy RCEME
Robertson	DW	4 CIBG LAD RCEME Europe
Rodd	EL	2 Fd Wksp RCEME Camp Petawawa
Ronan	JM	56 Inf Wksp
Russell	MM	13 Coy RCEME
Schleihauf	GH	C&D Estb CAS(W)

Class 2

Sedger	CA	11 Coy RCEME
Seeley	HR	HQ RCEME Cencom Oakville
Sequin	RH	4 CIBG LAD RCEME Europe
Silzer	J	7 Coy RCEME
Simpson	WG	2 Coy RCEME
Smith	GE	3 Coy RCEME
Smith	GW	13 Coy RCEME
Smith	J	202 Base Wksp RCEME
Smith	LWC	DEME
Smith	NC	DEME
Smyth	WC	204 Base Wksp RCEME
Sochasky	CN	C&D Estb CAS(W)
St Germain	NJ	DEME
Stever	JD	202 Base Wksp RCEME
Stirton	J	8 Personnel Depot
Starbo	RM	13 Coy RCEME
Taylor	CE	4 Fd Wksp RCEME Europe
Taylor	HE	3 Fd Wksp RCEME Camp Gagetown
Taylor	JF	56 Inf Wksp
Taylor	RT	7 Personnel Depot
Thibaudeau	AE	202 Base Wksp RCEME
Thomas	R	7 Coy RCEME
Toms	FA	202 Base Wksp RCEME
Trattles	EW	HQ C&D Estb CJATC
Trinca	JL	8 CH LAD Europe
Walker	J	202 Base Wksp RCEME
Warminton	JN	3 Coy RCEME
Weaver	CR	DEME
Wild	EB	LdSH(RC) LAD Calgary
Wood	WJ	2 RCHA LAD RCEME Winnipeg
Woodrow	JA	2 Fd Wksp RCEME Camp Petawawa
Wright	EO	RCEME School
Wright	EG	HQ Eascom
Young	RJ	11 Coy RCEME

Answers to Management Quiz

1. True. See Fig 1 to EME Manual Management H 400.

2. False. See Fig 1 to EME Manual Management H 400.

3. True. See EME Manual Management H 042.

4. No. See EME Manual Management H 050.

5. Ear plugs or ear muffs. See Canadian Forces Medical Order (CFMO) 40.01.

6. The Commanding Officers. See Canadian Forces Medical Order (CFMO) 40.01.